

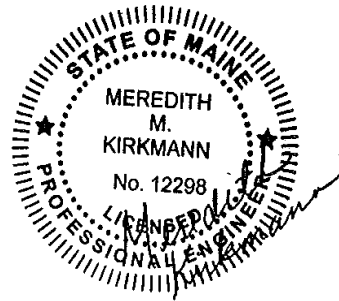
**MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE**

GEOTECHNICAL DESIGN REPORT

For the Slope Stability Evaluation of a Portion of:

**PLEASANT HILL ROAD
SABATTUS, MAINE**

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Androscoggin County

WIN 19081.00
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Soils Report No. 2015-31

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GEOTECHNICAL DESIGN SUMMARY

The purpose of this Geotechnical Design Report is to present subsurface information and make geotechnical recommendations regarding the stability of the embankment along a portion of Pleasant Hill Road in Sabattus, Maine. In the project area the roadway abuts the Sabattus Public Works facility to the east, including a capped landfill, and a former borrow pit to the west. The borrow pit excavation has created steep slopes along the roadway which are experiencing surficial failure that is impacting the overall safety and stability of the existing roadway. Proposed construction will include realignment of the roadway, reconstruction of Pleasant Hill Road and construction of stable embankment slopes in the area of the existing borrow pit. The following design recommendations are discussed in detail in Section 6.0.

Slope Stability Modeling and Proposed Slope Design - The proposed slopes have been evaluated for stability. The proposed slope reconstruction treatments include:

- construction of embankment extensions over the existing slope at a 2H:1V slope,
- over-excavation of the existing slope to a slope of 1.5H:1V followed by construction of embankment extensions at a 2H:1V slope, and
- over-excavation of the existing slope using benching of the existing slope followed by construction of embankment extensions at a 2H:1V slope.

Analyses of these options resulted in acceptable factors of safety. The construction of slopes at a slope of 2H:1V is recommended. Areas of over-excavation and slope benching will be shown in the Contract Plans. The embankment shall be constructed in accordance with Standard Specification Section 203.

Settlement - Settlement due to the placement of fill materials is anticipated to occur during construction and will have negligible effect on the proposed roadway. The soils in this area have been previously exposed to loading conditions similar to those proposed for reconstruction of the slopes.

Construction Consideration - During construction all embankment materials shall meet designated embankment compaction requirements determined in the field for this project. This includes embankment and subbase material outside the 1 vertical to 1 ½ horizontal slope extending from the edge of the finished shoulder to the existing ground.

Over-excavation and benching of the existing slope will be required as shown in the Contract Plans. Benched sections shall be compacted using a minimum of four (4) passes of a walk behind compactor or to match compaction efforts required to achieve 90% of the maximum density as determined by AASHTO T180 Method C or D and required by Standard Specification Section 203.11 Construction of Earth Embankment – Layer Method.

1.0 INTRODUCTION

The purpose of this Geotechnical Design Report is to present subsurface information and make geotechnical recommendations regarding the stability of the embankment along a portion of Pleasant Hill Road in Sabattus, Maine. The Highway project begins approximately 0.33 miles north of the intersection of Route 9 and Jordan Bridge Road continuing northeasterly to a point approximately 0.03 miles south of the intersection of Route 9 and Route 132 as shown on Sheet 1 – Location Map.

Pleasant Hill Road is a Priority 4 Highway Corridor and connects Routes 9 and 132 to the north and Route 9 to the south. In the project area the roadway abuts the Sabattus Public Works facility to the east, including a capped landfill, and a former borrow pit to the west. The borrow pit excavation has created steep slopes along the roadway which are experiencing surficial failure that is impacting the overall safety and stability of the existing roadway. A subsurface investigation for the evaluation of slope stability in the vicinity of Stations 25+00 to 33+00 has been completed. This report presents the soils information obtained at the site during the subsurface investigation and design and construction recommendations for the slope reconstruction.

Proposed construction will include realignment of the roadway, reconstruction of Pleasant Hill Road and construction of stable embankment slopes in the area of the existing borrow pit. The roadway will be closed during the highway reconstruction.

2.0 GEOLOGIC SETTING

According to the Surficial Geology Map of the of the Lisbon Falls North Quadrangle, Maine Open File 03-14 (2003) published by the Maine Geologic Survey, the surficial soils in the vicinity of the project consist of marine delta deposits named the Pleasant Hill Delta. This is a glacial-marine delta composed of sorted and stratified sand and gravel. According to the Surficial Geology Map, the deposit was graded to the surface of the late-glacial sea. The Pleasant Hill Delta has a topset-foreset contact at elevation 323 feet, meaning that the glacial deposits have a change in stratigraphy at that elevation, as illustrated below in Figure 1 from the Journal of Sedimentary Research.

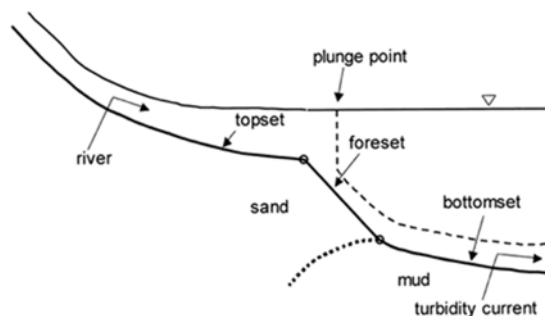


Figure 1 – Topset-Foreset Illustration

3.0 SUBSURFACE INVESTIGATION

Subsurface conditions at the site were explored by drilling five (5) borings (HB-SAB-201, and HB-SAB-301 through HB-SAB-304) and one (1) probe (HB-SAB-202). Boring HB-SAB-201 and probe HB-SAB-202 were drilled on January 21, 2015 by the MaineDOT drill crew using a trailer mounted drill rig. Borings (HB-SAB-301 through HB-SAB-304) were drilled on May 21, 2015 by New England Boring Contractors (NEBC) using a track mounted Mobile Drill B-50 rig. Exploration locations are shown on Sheets 2 through 4 - Boring Location Plans. Details and sampling methods used, field data obtained, and soil and groundwater conditions encountered are presented Appendix A - Boring Logs.

Boring HB-SAB-201 was drilled using solid stem auger and cased wash boring techniques. Probe HB-SAB-202 was drilled using solid stem auger boring techniques. Borings HB-SAB-301 through HB-SAB-304 were drilled using hollow stem auger boring techniques. The purpose of the borings was to obtain information for evaluation of the slopes into the adjacent gravel pit. In the borings, soil samples were obtained in the borings at 5-foot intervals using Standard Penetration Test (SPT) methods. During SPT sampling, the sampler is driven 24 inches and the hammer blows for each 6 inch interval of penetration are recorded. The sum of the blows for the second and third intervals is the N-value, or standard penetration resistance. The MaineDOT drill rig is equipped with an automatic hammer to drive the split spoon. The hammer was calibrated in October 2014 and was found to deliver approximately 51 percent more energy during driving than the standard rope and cathead system. N-values for boring HB-SAB-201 discussed in this report are corrected values computed by applying an average energy transfer factor of 0.908 to the raw field N-values. This hammer efficiency factor, 0.908, and both the raw field N-value and the corrected N-value are shown on the boring log. The NEBC drill rig uses a rope and cathead system to drive the split spoon and does not required any correction to the N-values obtained during drilling.

The MaineDOT Geotechnical Team member selected the boring and probe locations, drilling methods, designated type and depth of sampling techniques, reviewed field logs for accuracy and identified field and laboratory testing requirements. A New England Transportation Technician Certification Program (NETTCP) Certified Subsurface Inspector logged the subsurface conditions encountered. The boring and probe were located in the field by taping to site features after completion of the drilling program.

4.0 LABORATORY TESTING

A laboratory testing program was conducted on selected soil samples obtained in the test borings to assist in soil classification, evaluation of engineering properties of the soils and geologic assessment of the project site. Laboratory testing consisted of fifteen (15) standard grain size analyses with natural water content. The results of these laboratory tests are included in Appendix B - Laboratory Test Results and on the Boring Logs in Appendix A.

5.0 SUBSURFACE CONDITIONS

Subsurface conditions encountered at the test borings and probe generally consisted of sand and gravel. The full thickness of the deposit was not penetrated during the investigation. The exploration locations are shown on Sheets 2 through 4– Boring Location Plan. The Boring Logs are provided in Appendix A - Boring Logs.

5.1 200-Series Explorations

Test boring HB-SAB-201 and probe HB-SAB-202 were drilled in the existing roadway in the vicinity of Stations 21+00 to 22+00. At the boring and probe locations the existing pavement layer was found to have a thickness of approximately 3.0 to 3.5 inches of hot mix asphalt (HMA). The existing pavement was underlain by sand, gravel and gravelly sand. Boring HB-SAB-201 was drilled to a depth of approximately 24.0 feet below ground surface (bgs) and did not encounter a refusal surface. Probe HB-SAB-202 was drilled to a depth of approximately 35.0 feet (bgs) and did not encounter a refusal surface. No soil samples were obtained in the probe. The full thickness of the sand and gravel layer was not penetrated in either the boring or the probe.

Corrected SPT N-values in the sand, gravel and gravelly sand ranged from 21 to 100 blows per foot (bpf) indicating that the deposit is medium dense to very dense in consistency. Natural water contents obtained from the sand, gravel and gravelly sand samples ranged from approximately 3 to 11 percent. Grain size analyses conducted on four (4) samples of the sand, gravel and gravelly sand resulted in the soil being classified as an A-1-b or A-1-a under the AASHTO Soil Classification System and an SM, GW-GM or SW-SM under the Unified Soil Classification System.

5.2 300-Series Borings

Borings HB-SAB-301 through HB-SAB-304 were drilled in the vicinity of Stations 26+00 to 33+00 in order to evaluate the west slope of the roadway into the adjacent borrow pit.

Boring HB-SAB-301: This boring was drilled in the existing roadway at the top of the existing borrow pit slope. At the boring location the existing pavement layer was found to have a thickness of approximately 2.5 inches of HMA. Boring HB-SAB-301 was drilled to a depth of approximately 62.0 feet bgs and did not encounter a refusal surface. The soils encountered at the boring location were:

- Tan-brown, damp, gravelly fine to medium sand, trace silt, trace coarse sand;
- Tan, damp to moist, fine to coarse sand, trace to some gravel, trace silt;
- Grey-tan, moist, fine to coarse sand, some gravel, little silt;
- Tan, damp, fine sand, trace medium sand, trace silt;
- Tan, wet, silty fine sand, some silt trace gravel; and
- Tan-grey, wet, fine to coarse sand, some gravel, little silt.

The full thickness of the layer was not penetrated in the boring.

Corrected SPT N-values in the sand ranged from 5 to 68 bpf indicating a soil that is loose to very dense in consistency. Natural water contents obtained from the sand samples ranged from approximately 2 to 13 percent. Grain size analyses conducted on five (5) samples of the sand resulted in the soil being classified as an A-1-b, A-3 or A-2-4 under the AASHTO Soil Classification System and an SP, SP-SM, SW-SM, or SM under the Unified Soil Classification System.

Borings HB-SAB-302, -303, and -304: These three (3) borings were located at the bottom of the borrow pits and toe of the existing borrow pit slopes. The borings were all drilled to a depth of approximately 22 feet bgs and did not encounter a refusal surface. The soils encountered at the boring locations were:

- Brown, wet, gravelly fine to coarse sand, trace silt;
- Brown, wet, fine to coarse sand, little to some gravel, trace silt;
- Brown, wet, fine to medium sand, trace coarse sand, trace silt, trace gravel;
- Brown, wet, fine to coarse sand, little to some gravel, trace silt;
- Brown, wet, fine to coarse sandy gravel, little silt;
- Brown, wet, gravel, some fine to coarse sand, trace to little silt;
- Tan, damp to wet, fine sand, trace silt;
- Tan, wet, fine to coarse sand, little silt, little gravel;

The full thickness of the layer was not penetrated in the borings.

Corrected SPT N-values in the sand and gravel ranged from 9 to 30 bpf indicating a soil that is loose to medium dense in consistency. Natural water contents obtained from the sand and gravel samples ranged from approximately 4 to 19 percent. Grain size analyses conducted on six (6) samples of the sand and gravel resulted in the soil being classified as an A-1-a, A-3, A-1-b, or A-2-4 under the AASHTO Soil Classification System and an SW-SM, SP, SP-SM or SM under the Unified Soil Classification System.

5.3 Groundwater

The groundwater levels measured during drilling activities are presented in Table 1 below and are indicated on the boring logs in Appendix A. No water was introduced into the boreholes during the drilling operations. Groundwater levels along the project will fluctuate with seasonal changes, runoff and adjacent construction activities.

| Boring Number | Approximate Depth to Groundwater Table | Approximate Elevation of Groundwater Table (NAVD88) |
|---------------|--|---|
| HB-SAB-201 | None Observed | -- |
| HB-SAB-202 | None Observed | -- |
| HB-SAB-301 | 56.6 feet | 244.4 feet |
| HB-SAB-302 | 4.9 feet | 243.6 feet |
| HB-SAB-303 | 5.0 feet | 243.5 feet |
| HB-SAB-304 | 11.0 feet | 245.5 feet |

Table 1 – Groundwater Depths and Elevations

6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

The proposed roadway slopes will consist of embankment fills, embankment cuts, areas of overexcavation and embankment fills, and areas of overexcavation with benched slopes and embankment fills. The following sections discuss the geotechnical design of the slopes.

6.1 Slope Stability Modeling and Proposed Slope Design

The proposed slopes along a portion of Pleasant Hill Road in the vicinity of the existing borrow pit (to the west) have been evaluated for stability. In order to evaluate this stability, conditions were modeled using SLIDE 6.0 from Rocscience. Models were created at Stations 25+50, 26+50, 28+00, 31+50, and 32+50 and to represent the conditions along the proposed slopes.

The proposed slope treatments were modeled in order to evaluate the effectiveness of the proposed slope reconstruction treatments. In accordance with AASHTO LRFD Bridge Design Specifications 7th Edition 2014 (LRFD) Article 11.6.2.3, a factor of safety of 1.3 (resistance factor $\phi=0.75$) is required for overall slope stability of earth slopes where the geotechnical parameters are well defined and the slope does not support or contain a structural element.

The proposed slope reconstruction treatments include:

- construction of embankment extensions over the existing slope at a 2H:1V slope,
- over-excavation of the existing slope to a slope of 1.5H:1V followed by construction of embankment extensions at a 2H:1V slope, and
- over-excavation of the existing slope using benching of the existing slope followed by construction of embankment extensions at a 2H:1V slope.

Analyses of these options resulted in acceptable factors of safety (greater than 1.3) at all of the Stations evaluated. Results from the SLIDE 6.0 analyses are included in Appendix C.

The construction of slopes at a slope of 2H:1V is recommended. Areas of over-excavation and slope benching will be shown in the Contract Plans. The embankment shall be constructed in accordance with Standard Specification Section 203 Construction of Earth Embankment – Layer Method.

6.2 Settlement

Fill materials will be placed along the slopes of the existing gravel pit in order to construct 2H:1V slopes. Settlement due to the placement of these materials is anticipated to occur during construction and will have negligible effect on the proposed roadway. The soils in this area have been previously exposed to loading conditions similar to those proposed for reconstruction of the slopes.

6.3 Construction Considerations

During construction all embankment materials shall meet designated embankment compaction requirements determined in the field for this project. This includes embankment and subbase material outside the 1 vertical to 1 ½ horizontal slope extending from the edge of the finished shoulder to the existing ground.

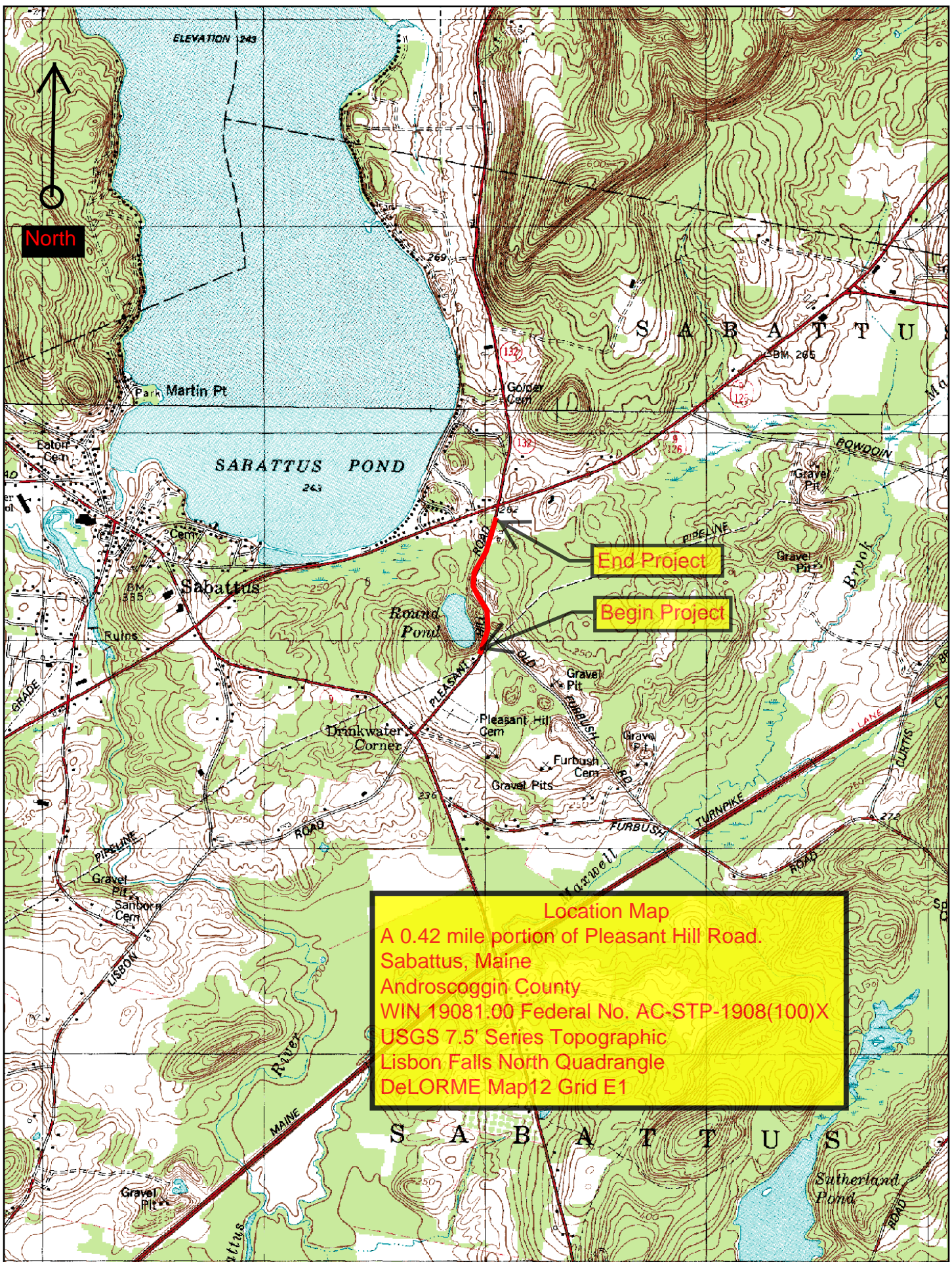
Over-excavation and benching of the existing slope will be required as shown in the Contract Plans. Benched sections shall be compacted using a minimum of four (4) passes of a walk behind compactor or to match compaction efforts required to achieve 90% of the maximum density as determined by AASHTO T180 Method C or D and required by Standard Specification Section 203.11 Construction of Earth Embankment – Layer Method.

7.0 CLOSURE

This report has been prepared for the use of the MaineDOT Multimodal Program for specific application to the stability of the embankment along a portion of Pleasant Hill Road in Sabattus, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

In the event that any changes in the nature, design, or location of the proposed project are planned, this report should be reviewed by a geotechnical engineer to assess the appropriateness of the conclusions and recommendations, and to modify the recommendations as appropriate to reflect the changes in design. Further, the analyses and recommendations are based in part upon limited soil explorations at discrete locations completed at the site. If variations from the conditions encountered during the investigation appear evident during construction, it may also become necessary to re-evaluate the recommendations made in this report.

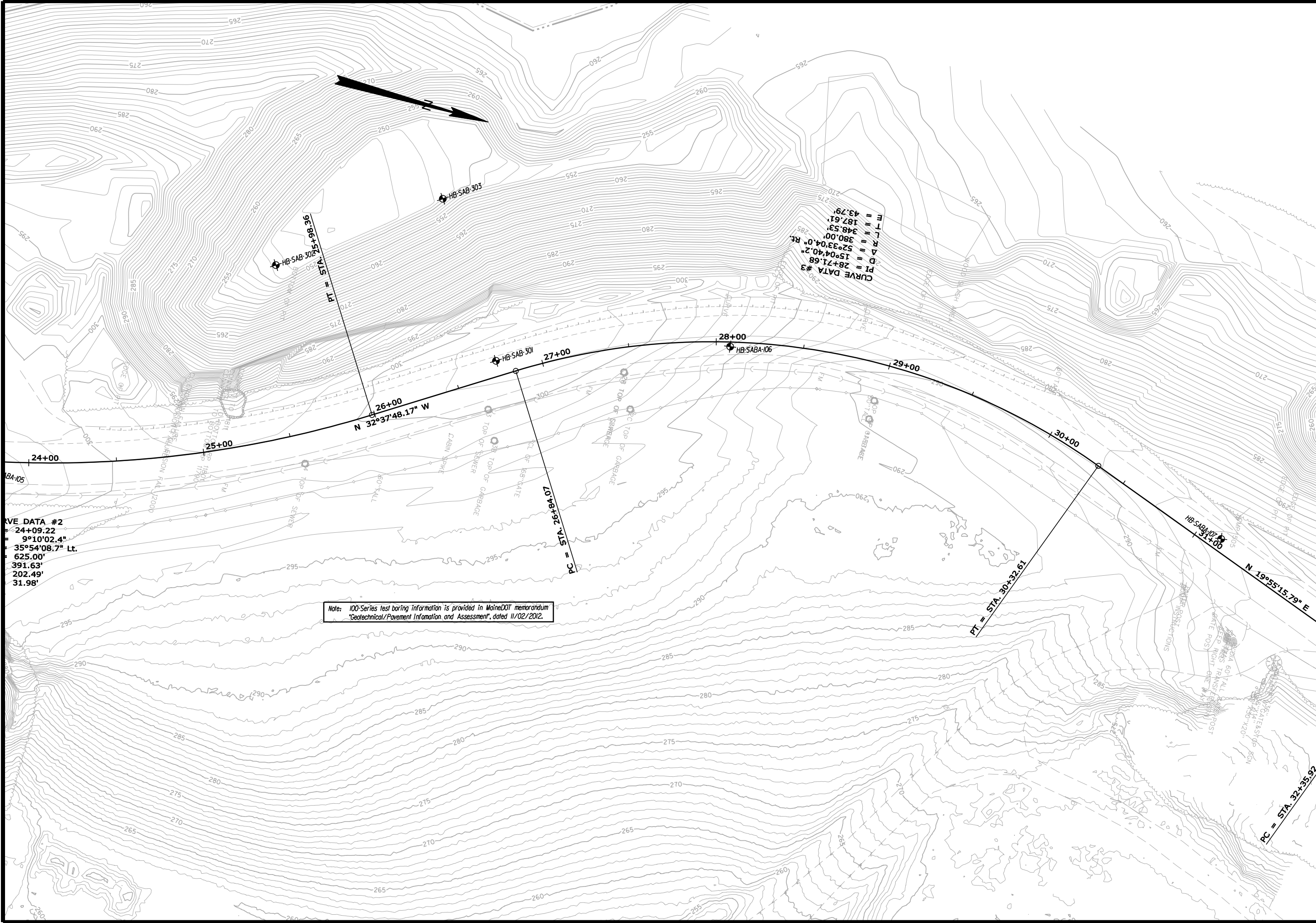
Sheets



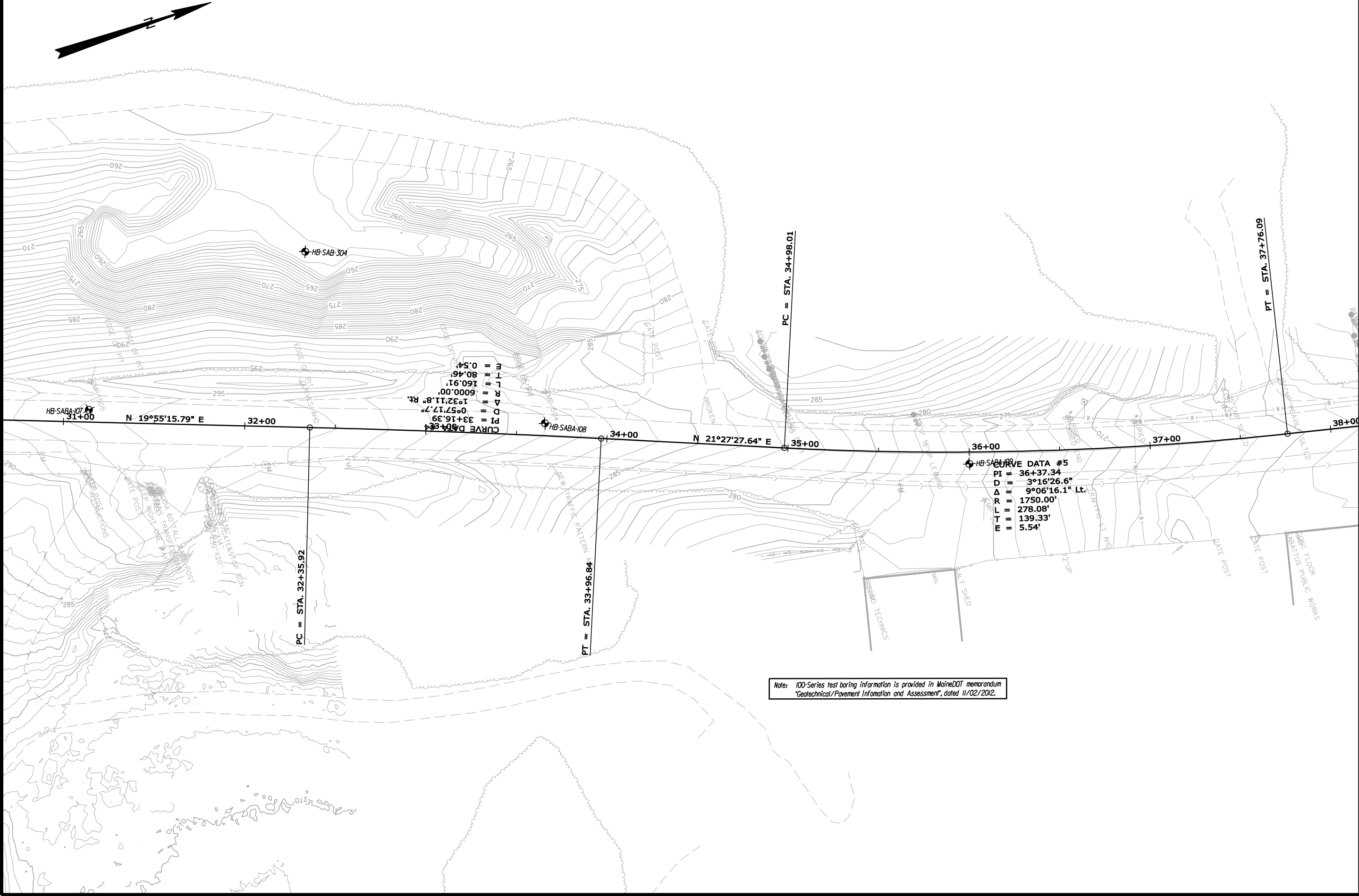
Map Scale 1:24000



| STATE OF MAINE | | DEPARTMENT OF TRANSPORTATION | |
|---------------------------|--|------------------------------|--|
| ROUTE 9/PLEASANT HILL RD. | | AC-STP-1908(100)X | |
| BORING LOCATION PLAN | | WIN 19081.00 HIGHWAY PLANS | |
| SHEET NUMBER | | DATE | |
| 2 | | OCT 2015 | |
| OF 4 | | P.E. NUMBER | |
| | | SIGNATURE | |
| | | M. KERRIAN | |
| | | BY | |
| | | T. WHITE | |
| | | PROJ. MANAGER | |
| | | DESIGN-DETAILED | |
| | | CHECKED-REVIEWED | |
| | | DESIGNS DETAIL D3 | |
| | | DESIGNS DETAIL D3 | |
| | | REVISIONS 1 | |
| | | REVISIONS 2 | |
| | | REVISIONS 3 | |
| | | REVISIONS 4 | |
| | | FIELD CHANGES | |



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|--------------|----------------------|---------------------------------------|--------------------|---------------|----------|-------------|---|
| SHEET NUMBER | | SABATTUS ROUTE 9/PLEASANT HILL RD. | | PROJ. MANAGER | BY | DATE | STATE OF MAINE DEPARTMENT OF TRANSPORTATION AC-STP-1908(100)X WIN 19081.00 HIGHWAY PLANS |
| 3 OF 4 | BORING LOCATION PLAN | | DESIGN-DETAILED | | | | |
| | | | CHECKED-REVIEWED | | | SIGNATURE | |
| | | | DESIGN-2 DETAIL 02 | MAKRIKUMANN | OCT 2015 | | |
| | | | DESIGN-3 DETAIL 03 | | | P.E. NUMBER | |
| | | | REVISIONS 1 | | | | |
| | | | REVISIONS 2 | | | | |
| | | | REVISIONS 3 | | | | |
| | | | REVISIONS 4 | | | DATE | |
| | | | FIELD CHANGES | | | | |



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| SHEET NUMBER | 4 | OF 4 | SABATTUS ROUTE 9/PLEASANT HILL RD. | | | | PROJ. MANAGER | BY | DATE |
| | | | DESIGN-DETAILED | CHECKED-REVIEWED | | | | | |
| | | | DESIGN2-DETAILED2 | MARKMANN | T. WHITE | OCT 2015 | SIGNATURE | | |
| | | | DESIGN3-DETAILED3 | | | | P.E. NUMBER | | |
| | | | REVISIONS 1 | | | | | | |
| | | | REVISIONS 2 | | | | | | |
| | | | REVISIONS 3 | | | | | | |
| | | | REVISIONS 4 | | | | | | |
| | | | FIELD CHANGES | | | | DATE | | |
| | | | BORING LOCATION PLAN | | | AC-STP-1908(100)X | | | |
| | | | WIN 19081.00 | | | | | | |
| | | | HIGHWAY PLANS | | | | | | |

Appendix A


Boring Logs

| UNIFIED SOIL CLASSIFICATION SYSTEM | | | | | TERMS DESCRIBING DENSITY/CONSISTENCY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|----------------------------|--|--------------------|-----------------|-------------------|-----------|------------------------|--------------------|--------------------------------|-----------|-------------------------------|--|------------|------------|---------------------------------------|--------|--------------|-------------|-------------------------------------|------------|------------|-------------|-----------------------|------|-----|-----------|---------------------------------------|
| MAJOR DIVISIONS | | | GROUP SYMBOLS | TYPICAL NAMES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size) | GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size) | CLEAN GRAVELS | GW | Well-graded gravels, gravel-sand mixtures, little or no fines | Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Consistency is rated according to standard penetration resistance. Modified Burmister System <table><tr><th>Descriptive Term</th><th>Portion of Total</th></tr><tr><td>trace</td><td>0% - 10%</td></tr><tr><td>little</td><td>11% - 20%</td></tr><tr><td>some</td><td>21% - 35%</td></tr><tr><td>adjective (e.g. sandy, clayey)</td><td>36% - 50%</td></tr></table> <table><tr><th>Density of Cohesionless Soils</th><th>Standard Penetration Resistance N-Value (blows per foot)</th></tr><tr><td>Very loose</td><td>0 - 4</td></tr><tr><td>Loose</td><td>5 - 10</td></tr><tr><td>Medium Dense</td><td>11 - 30</td></tr><tr><td>Dense</td><td>31 - 50</td></tr><tr><td>Very Dense</td><td>> 50</td></tr></table> | | | | Descriptive Term | Portion of Total | trace | 0% - 10% | little | 11% - 20% | some | 21% - 35% | adjective (e.g. sandy, clayey) | 36% - 50% | Density of Cohesionless Soils | Standard Penetration Resistance N-Value (blows per foot) | Very loose | 0 - 4 | Loose | 5 - 10 | Medium Dense | 11 - 30 | Dense | 31 - 50 | Very Dense | > 50 | | | | | |
| | | Descriptive Term | Portion of Total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | trace | 0% - 10% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | little | 11% - 20% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | some | 21% - 35% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | adjective (e.g. sandy, clayey) | 36% - 50% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Density of Cohesionless Soils | Standard Penetration Resistance N-Value (blows per foot) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Very loose | 0 - 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Loose | 5 - 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Medium Dense | 11 - 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dense | 31 - 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Very Dense | > 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (little or no fines) | GP | Poorly-graded gravels, gravel sand mixtures, little or no fines | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRAVEL WITH FINES (Appreciable amount of fines) | GM | Silty gravels, gravel-sand-silt mixtures. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GC | Clayey gravels, gravel-sand-clay mixtures. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SANDS (more than half of coarse fraction is smaller than No. 4 sieve size) | CLEAN SANDS | SW | Well-graded sands, gravelly sands, little or no fines | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (little or no fines) | SP | Poorly-graded sands, gravelly sand, little or no fines. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SANDS WITH FINES (Appreciable amount of fines) | SM | Silty sands, sand-silt mixtures | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC | Clayey sands, sand-clay mixtures. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size) | SILTS AND CLAYS (liquid limit less than 50) | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity. | Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to shear strength as indicated. <table><tr><th>Consistency of Cohesive soils</th><th>SPT N-Value blows per foot</th><th>Approximate Undrained Shear Strength (psf)</th><th>Field Guidelines</th></tr><tr><td>Very Soft</td><td>WOH, WOR, WOP, <2</td><td>0 - 250</td><td>Fist easily Penetrates</td></tr><tr><td>Soft</td><td>2 - 4</td><td>250 - 500</td><td>Thumb easily penetrates</td></tr><tr><td>Medium Stiff</td><td>5 - 8</td><td>500 - 1000</td><td>Thumb penetrates with moderate effort</td></tr><tr><td>Stiff</td><td>9 - 15</td><td>1000 - 2000</td><td>Indented by thumb with great effort</td></tr><tr><td>Very Stiff</td><td>16 - 30</td><td>2000 - 4000</td><td>Indented by thumbnail</td></tr><tr><td>Hard</td><td>>30</td><td>over 4000</td><td>Indented by thumbnail with difficulty</td></tr></table> | | | | Consistency of Cohesive soils | SPT N-Value blows per foot | Approximate Undrained Shear Strength (psf) | Field Guidelines | Very Soft | WOH, WOR, WOP, <2 | 0 - 250 | Fist easily Penetrates | Soft | 2 - 4 | 250 - 500 | Thumb easily penetrates | Medium Stiff | 5 - 8 | 500 - 1000 | Thumb penetrates with moderate effort | Stiff | 9 - 15 | 1000 - 2000 | Indented by thumb with great effort | Very Stiff | 16 - 30 | 2000 - 4000 | Indented by thumbnail | Hard | >30 | over 4000 | Indented by thumbnail with difficulty |
| | | Consistency of Cohesive soils | SPT N-Value blows per foot | | | | | Approximate Undrained Shear Strength (psf) | Field Guidelines | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Very Soft | WOH, WOR, WOP, <2 | | | | | 0 - 250 | Fist easily Penetrates | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Soft | 2 - 4 | 250 - 500 | | | | | Thumb easily penetrates | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Medium Stiff | 5 - 8 | 500 - 1000 | | | | | Thumb penetrates with moderate effort | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Stiff | 9 - 15 | 1000 - 2000 | | | | | Indented by thumb with great effort | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Very Stiff | 16 - 30 | 2000 - 4000 | Indented by thumbnail | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hard | >30 | over 4000 | Indented by thumbnail with difficulty | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OL | Organic silts and organic silty clays of low plasticity. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SILTS AND CLAYS (liquid limit greater than 50) | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CH | Inorganic clays of high plasticity, fat clays. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | OH | Organic clays of medium to high plasticity, organic silts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | HIGHLY ORGANIC SOILS | Pt | Peat and other highly organic soils. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Desired Soil Observations: (in this order) Color (Munsell color chart) Moisture (dry, damp, moist, wet, saturated) Density/Consistency (from above right hand side) Name (sand, silty sand, clay, etc., including portions - trace, little, etc.) Gradation (well-graded, poorly-graded, uniform, etc.) Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic) Structure (layering, fractures, cracks, etc.) Bonding (well, moderately, loosely, etc., if applicable) Cementation (weak, moderate, or strong, if applicable, ASTM D 2488) Geologic Origin (till, marine clay, alluvium, etc.) Unified Soil Classification Designation Groundwater level | | | | | Rock Quality Designation (RQD): RQD = $\frac{\text{sum of the lengths of intact pieces of core} > 100 \text{ mm}}{\text{length of core advance}}$ *Minimum NQ rock core (1.88 in. OD of core) Correlation of RQD to Rock Mass Quality <table><tr><th>Rock Mass Quality</th><th>RQD</th></tr><tr><td>Very Poor</td><td><25%</td></tr><tr><td>Poor</td><td>26% - 50%</td></tr><tr><td>Fair</td><td>51% - 75%</td></tr><tr><td>Good</td><td>76% - 90%</td></tr><tr><td>Excellent</td><td>91% - 100%</td></tr></table> Desired Rock Observations: (in this order) Color (Munsell color chart) Texture (aphanitic, fine-grained, etc.) Lithology (igneous, sedimentary, metamorphic, etc.) Hardness (very hard, hard, mod. hard, etc.) Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.) Geologic discontinuities/jointing: -dip (horiz - 0-5, low angle - 5-35, mod. dipping - 35-55, steep - 55-85, vertical - 85-90) -spacing (very close - <5 cm, close - 5-30 cm, mod. close 30-100 cm, wide - 1-3 m, very wide >3 m) -tightness (tight, open or healed) -infilling (grain size, color, etc.) Formation (Waterville, Ellsworth, Cape Elizabeth, etc.) RQD and correlation to rock mass quality (very poor, poor, etc.) ref: AASHTO Standard Specification for Highway Bridges 17th Ed. Table 4.4.8.1.2A Recovery | | | | Rock Mass Quality | RQD | Very Poor | <25% | Poor | 26% - 50% | Fair | 51% - 75% | Good | 76% - 90% | Excellent | 91% - 100% | | | | | | | | | | | | | | | |
| Rock Mass Quality | RQD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Very Poor | <25% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Poor | 26% - 50% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fair | 51% - 75% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Good | 76% - 90% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Excellent | 91% - 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maine Department of Transportation Geotechnical Section Key to Soil and Rock Descriptions and Terms Field Identification Information | | | | | Sample Container Labeling Requirements: <table><tr><td>PIN</td><td>Blow Counts</td></tr><tr><td>Bridge Name / Town</td><td>Sample Recovery</td></tr><tr><td>Boring Number</td><td>Date</td></tr><tr><td>Sample Number</td><td>Personnel Initials</td></tr><tr><td>Sample Depth</td><td></td></tr></table> | | | | PIN | Blow Counts | Bridge Name / Town | Sample Recovery | Boring Number | Date | Sample Number | Personnel Initials | Sample Depth | | | | | | | | | | | | | | | | | | |
| PIN | Blow Counts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bridge Name / Town | Sample Recovery | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boring Number | Date | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sample Number | Personnel Initials | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sample Depth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div> | | | | <div>Project: Pleasant Hill Rd (Routes 9/132)</div> <div>Location: Sabattus, Maine</div> | | <div>Boring No.: HB-SAB-201</div> <div>WIN: 19081.00</div> | | | | | | | |
| Driller: MaineDOT | | | Elevation (ft.) 321.2 | | Auger ID/OD: 5" Dia. | | | | | | | | |
| Operator: Giles/Daggett | | | Datum: NAVD 88 | | Sampler: Standard Split Spoon | | | | | | | | |
| Logged By: B. Wilder | | | Rig Type: CME 45C | | Hammer Wt./Fall: 140#/30" | | | | | | | | |
| Date Start/Finish: 12/15/2014; 09:30-13:30 | | | Drilling Method: Cased Wash Boring | | Core Barrel: N/A | | | | | | | | |
| Boring Location: 21+77, 9.2 Rt. | | | Casing ID/OD: NW | | Water Level*: None Observed | | | | | | | | |
| Hammer Efficiency Factor: 0.908 | | | Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> | | | | | | | | | | |
| <div>Definitions:</div> <div>D = Split Spoon Sample</div> <div>MD = Unsuccessful Split Spoon Sample attempt</div> <div>U = Thin Wall Tube Sample</div> <div>MU = Unsuccessful Thin Wall Tube Sample attempt</div> <div>V = Insitu Vane Shear Test, PP = Pocket Penetrometer</div> <div>MV = Unsuccessful Insitu Vane Shear Test attempt</div> <div>R = Rock Core Sample</div> <div>SSA = Solid Stem Auger</div> <div>HSA = Hollow Stem Auger</div> <div>RC = Roller Cone</div> <div>WOH = weight of 140lb. hammer</div> <div>WOR/C = weight of rods or casing</div> <div>WO1P = Weight of one person</div> <div>S_u = Insitu Field Vane Shear Strength (psf)</div> <div>T_v = Pocket Torvane Shear Strength (psf)</div> <div>q_p = Unconfined Compressive Strength (ksf)</div> <div>N-uncorrected = Raw field SPT N-value</div> <div>Hammer Efficiency Factor = Annual Calibration Value</div> <div>N₆₀ = SPT N-uncorrected corrected for hammer efficiency</div> <div>N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected</div> <div>S_{u(lab)} = Lab Vane Shear Strength (psf)</div> <div>WC = water content, percent</div> <div>LL = Liquid Limit</div> <div>PL = Plastic Limit</div> <div>PI = Plasticity Index</div> <div>G = Grain Size Analysis</div> <div>C = Consolidation Test</div> | | | | | | | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/AASHTO and Unified Class. | | |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N ₆₀ | Casing Blows | Elevation (ft.) | | | | | |
| 0 | | | | | | | SSA | 320.91 | | 3½" PAVEMENT 0.29' | | | |
| 5 | 1D | 18/12 | 5.00 - 6.50 | 15/16/50 | 66 | 100 | | | | | | Brown, damp, very dense, fine to coarse SAND, some gravel, little silt, occasional (4-6") cobbles from 6.5-7.0 ft bgs. | G#263484 A-1-b, SM WC=2.8% |
| 10 | 2D | 24/17 | 10.00 - 12.00 | 48/50/15/18 | 65 | 98 | 130 | | | Brown, moist, very dense, fine to coarse SAND, some gravel, little silt, occasional cobbles. | G#263485 A-1-b, SM WC=7.3% | | |
| | | | | | | | 168 | | | | | | |
| | | | | | | | 104 | | | | | | |
| | | | | | | | 65 | | | | | | |
| 15 | 3D | 24/10 | 14.00 - 16.00 | 6/7/7/13 | 14 | 21 | 18 | | | | | Brown, moist, medium dense, GRAVEL, some sand, trace silt. | G#263486 A-1-a, GW-GM WC=7.3% |
| | | | | | | | 42 | | | | | | |
| | | | | | | | 96 | | | | | | |
| | | | | | | | 52 | | | | | | |
| | | | | | | | 62 | | | | | | |
| 20 | 4D | 24/9 | 19.00 - 21.00 | 38/13/13/13 | 26 | 39 | 34 | | | | | Brown, wet, medium dense, Gravelly SAND, trace silt. | G#263487 A-1-a, SW-SM WC=10.5% |
| | | | | | | | 58 | | | Bottom of Exploration at 24.00 feet below ground surface. NO REFUSAL, broke casing, left 10.0 ft in bore hole. | | | |
| | | | | | | | 82 | | | | | | |
| | | | | | | | 91 | | | | | | |
| | | | | | | | 110 | | | | | | |
| 25 | | | | | | | | 297.20 | | | | | |
| Remarks: | | | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | Page 1 of 1 | | | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | Boring No.: HB-SAB-201 | | | |

| Maine Department of Transportation <u>Soil/Rock Exploration Log</u> US CUSTOMARY UNITS | | | | Project: Pleasant Hill Rd (Routes 9/132) Location: Sabattus, Maine | | | | Boring No.: HB-SAB-202 WIN: 19081.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------|-----------------|--------------------|---|---------|--------------|-----------------|---|---|--|--|-------------|--------------------|--|--|--|--|--|--|--|--------------------------------|--|------------|-----------------|--------------------|--|---------|--------------|-----------------|-------------|---|--|--|--|--|--|-----|--------|--|---|------|---|--|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|--|
| Driller: MaineDOT | | | | Elevation (ft.): 320.4 | | | | Auger ID/OD: 5" Dia. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operator: Giles/Daggett | | | | Datum: NAVD 88 | | | | Sampler: Off Flights | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Logged By: B. Wilder | | | | Rig Type: CME 45C | | | | Hammer Wt./Fall: N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date Start/Finish: 12/15/2014-12/15/2014 | | | | Drilling Method: Solid Stem Auger | | | | Core Barrel: N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boring Location: 21+86, 9.0 ft Rt. | | | | Casing ID/OD: N/A | | | | Water Level*: None Observed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Definitions: D = Split Spoon Sample S = Sample off Auger Flight MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample R = Rock Core Sample V = Insitu Vane Shear Test SSA = Solid Stem Auger B = Bucket Sample off Auger Flight</div> <div>Definitions: S_u = Insitu Field Vane Shear Strength (psf) T_v = Pocket Torvane Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) S_{u(lab)} = Lab Vane Shear Strength (psf) W_{OH} = weight of 140lb. hammer W_{OR} = weight of rods W_{OC} = weight of casing</div> <div>Definitions: WC = water content, percent ≡ = Similar or Equal too LL = Liquid Limit RC = Roller Cone ahead PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th rowspan="2">Depth (ft.)</th><th colspan="8">Sample Information</th><th rowspan="2">Visual Description and Remarks</th><th rowspan="2">Laboratory Testing Results/ AASHTO and Unified Class</th></tr><tr><th>Sample No.</th><th>Pen./Rec. (in.)</th><th>Sample Depth (ft.)</th><th>Blows (/6 in.) Shear Strength (psf) or RQD (%)</th><th>N-value</th><th>Casing Blows</th><th>Elevation (ft.)</th><th>Graphic Log</th></tr><tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td>SSA</td><td>320.15</td><td></td><td>3" PAVEMENT Similar to HB-SAB-201.</td><td>0.25</td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>25</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> | | | | | | | | | | | | Depth (ft.) | Sample Information | | | | | | | | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-value | Casing Blows | Elevation (ft.) | Graphic Log | 0 | | | | | | SSA | 320.15 | | 3" PAVEMENT Similar to HB-SAB-201. | 0.25 | 5 | | | | | | | | | | | 10 | | | | | | | | | | | 15 | | | | | | | | | | | 20 | | | | | | | | | | | 25 | | | | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-value | Casing Blows | Elevation (ft.) | Graphic Log | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | | | | | | SSA | 320.15 | | 3" PAVEMENT Similar to HB-SAB-201. | 0.25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remarks: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Page 1 of 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boring No.: HB-SAB-202 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div> | | | | <div>Project: Pleasant Hill Rd Slope Failure</div> <div>(Routes 9/132)</div> <div>Location: Sabattus, Maine</div> | | <div>Boring No.: HB-SAB-301</div> <div>WIN: 19081.00</div> | | | | | | | |
| Driller: New England Boring | | | Elevation (ft.): 301.0 | | Auger ID/OD: 2.25/4.75" | | | | | | | | |
| Operator: Rudnicki/Maynard | | | Datum: NAVD88 | | Sampler: Standard Split Spoon | | | | | | | | |
| Logged By: Be Schonewald | | | Rig Type: Mobile Drill B-50 (Track) | | Hammer Wt./Fall: 140#/30" | | | | | | | | |
| Date Start/Finish: 5/21/2015; 08:55-13:05 | | | Drilling Method: Hollow Stem Auger | | Core Barrel: N/A | | | | | | | | |
| Boring Location: 26+75, 8.8 ft Lt. | | | Casing ID/OD: N/A | | Water Level*: 56.6 ft inside augers | | | | | | | | |
| Hammer Efficiency Factor: 0.6 | | | Hammer Type: Automatic <input type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input checked="" type="checkbox"/> | | | | | | | | | | |
| <div>Definitions:</div> <div>D = Split Spoon Sample</div> <div>MD = Unsuccessful Split Spoon Sample attempt</div> <div>U = Thin Wall Tube Sample</div> <div>MU = Unsuccessful Thin Wall Tube Sample attempt</div> <div>V = Insitu Vane Shear Test, PP = Pocket Penetrometer</div> <div>MV = Unsuccessful Insitu Vane Shear Test attempt</div> <div>R = Rock Core Sample</div> <div>SSA = Solid Stem Auger</div> <div>HSA = Hollow Stem Auger</div> <div>RC = Roller Cone</div> <div>WOH = weight of 140lb. hammer</div> <div>WOR/C = weight of rods or casing</div> <div>WO1P = Weight of one person</div> <div>S_u = Insitu Field Vane Shear Strength (psf)</div> <div>T_v = Pocket Torvane Shear Strength (psf)</div> <div>q_p = Unconfined Compressive Strength (ksf)</div> <div>N_{uncorrected} = Raw field SPT N-value</div> <div>Hammer Efficiency Factor = Annual Calibration Value</div> <div>N₆₀ = SPT N-uncorrected corrected for hammer efficiency</div> <div>N₆₀ = (Hammer Efficiency Factor/60%)*N_{uncorrected}</div> <div>S_{u(lab)} = Lab Vane Shear Strength (psf)</div> <div>WC = water content, percent</div> <div>LL = Liquid Limit</div> <div>PL = Plastic Limit</div> <div>PI = Plasticity Index</div> <div>G = Grain Size Analysis</div> <div>C = Consolidation Test</div> | | | | | | | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/AASHTO and Unified Class. | | |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N ₆₀ | Casing Blows | Elevation (ft.) | | | | | |
| 0 | | | | | | | HSA | 300.79 | | 2½" PAVEMENT ————— 0.21- | | | |
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| 5 | 1D | 24/9 | 5.00 - 7.00 | 5/4/12/37 | 16 | 16 | | | | | | Tan-brown, damp, medium dense, Gravelly fine to medium SAND, trace silt, trace coarse sand. Broken gravel in tip of spoon. | G#263901 A-1-b, SP WC=1.8% |
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| 10 | 2D | 24/11 | 10.00 - 12.00 | 4/4/3/3 | 7 | 7 | | | | | | Tan, damp, loose, fine to coarse SAND, little gravel, trace silt. | |
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| | | | | | | | | | | | | | |
| 15 | 3D | 24/19 | 15.00 - 17.00 | 3/2/3/3 | 5 | 5 | | | | | | Tan, damp, loose, fine to medium SAND, trace to little fine gravel, trace coarse sand, trace silt. | |
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| 20 | 4D | 24/18 | 20.00 - 22.00 | 3/4/5/5 | 9 | 9 | | | | | | Tan, damp, loose, fine to medium SAND, trace to little fine gravel, trace coarse sand, trace silt. | |
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| 25 | | | | | | | | | | | | | |
| Remarks: | | | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | Page 1 of 3 | | | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | Boring No.: HB-SAB-301 | | | |

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|--|--------------------|---|--------------------|---|---------------|---|--------------|-----------------|--|--|---|--|--|
| Maine Department of Transportation | | | | Project: Pleasant Hill Rd Slope Failure (Routes 9/132) | | Boring No.: HB-SAB-301 | | | | | | | |
| Soil/Rock Exploration Log US CUSTOMARY UNITS | | | | Location: Sabattus, Maine | | WIN: 19081.00 | | | | | | | |
| Driller: New England Boring | | Elevation (ft.): 301.0 | | Auger ID/OD: 2.25/4.75" | | | | | | | | | |
| Operator: Rudnicki/Maynard | | Datum: NAVD88 | | Sampler: Standard Split Spoon | | | | | | | | | |
| Logged By: Be Schonewald | | Rig Type: Mobile Drill B-50 (Track) | | Hammer Wt./Fall: 140#/30" | | | | | | | | | |
| Date Start/Finish: 5/21/2015; 08:55-13:05 | | Drilling Method: Hollow Stem Auger | | Core Barrel: N/A | | | | | | | | | |
| Boring Location: 26+75, 8.8 ft Lt. | | Casing ID/OD: N/A | | Water Level*: 56.6 ft inside augers | | | | | | | | | |
| Hammer Efficiency Factor: 0.6 | | Hammer Type: Automatic <input type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input checked="" type="checkbox"/> | | | | | | | | | | | |
| Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample attempt V = Insitu Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Insitu Vane Shear Test attempt | | R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = weight of 140lb. hammer WOR/C = weight of rods or casing WO1P = Weight of one person | | Su = Insitu Field Vane Shear Strength (psf) Tv = Pocket Torrvane Shear Strength (psf) qp = Unconfined Compressive Strength (ksf) N-uncorrected = Raw field SPT N-value Hammer Efficiency Factor = Annual Calibration Value N60 = SPT N-uncorrected corrected for hammer efficiency N60 = (Hammer Efficiency Factor/60%)*N-uncorrected | | Su(lab) = Lab Vane Shear Strength (psf) WC = water content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class. | | |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N60 | Casing Blows | Elevation (ft.) | | | | | |
| 25 | 5D | 24/14 | 25.00 - 27.00 | 3/4/3/7 | 7 | 7 | | |  | Tan, damp, loose, fine to medium SAND, little to some gravel, trace coarse sand, trace silt. | G#263902 A-3, SP-SM WC=5.1% | | |
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| 30 | 6D | 24/13 | 30.00 - 32.00 | 5/4/7/8 | 11 | 11 | | | | | | Tan, moist, medium dense, fine to coarse SAND, trace silt, trace gravel. | |
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| 35 | 7D | 24/12 | 35.00 - 37.00 | 5/8/11/10 | 19 | 19 | | | | | | Tan, moist, medium dense, fine to medium SAND, trace to little fine gravel, trace coarse sand, trace silt. | |
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| | | | | | | | | | | | | | |
| 40 | 8D | 24/17 | 40.00 - 42.00 | 6/7/8/11 | 15 | 15 | | | | | | Tan, moist, medium dense, fine to coarse SAND, some gravel, little silt. | |
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| | | | | | | | | | | | | | |
| 45 | 9D | 24/13 | 45.00 - 47.00 | 15/17/51/52 | 68 | 68 | | 254.70 | | Similar to 8D; changing at 46.3 ft bgs. | G#263903 A-1-b, SW-SM WC=2.2% | | |
| | | | | | | | | | | 9D (46.3-47.0 ft) Grey-tan, fine to coarse SAND, some gravel, little silt. | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 50 | | | | | | | | | | Boney to approximately 49.0 ft bgs. | | | |
| Remarks: | | | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | Page 2 of 3 | | | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | Boring No.: HB-SAB-301 | | | |

| Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS | | | | Project: Pleasant Hill Rd Slope Failure (Routes 9/132) Location: Sabattus, Maine | | | | Boring No.: HB-SAB-301 WIN: 19081.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------|-----------------|--------------------|---|---------------|-----|--------|--|-----------------|-------------|--|--|--|--|--|--|--|--|--|--|--|-------------|--------------------------------|--|-------------|------------|-----------------|--------------------|---|---------------|-----|--------|-------|-----------------|----|-----|-------|---------------|-------------|----|----|--|--|--|--|---|-----------------------------------|----|-----|-------|---------------|-------------|----|----|--|--|--|--|----|-----|-------|---------------|-------------|----|----|--|--|--|---|----|--|--|--|--|--|--|--|--|--|---|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Driller: New England Boring | | | | Elevation (ft.): 301.0 | | | | Auger ID/OD: 2.25/4.75" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operator: Rudnicki/Maynard | | | | Datum: NAVD88 | | | | Sampler: Standard Split Spoon | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Logged By: Be Schonewald | | | | Rig Type: Mobile Drill B-50 (Track) | | | | Hammer Wt./Fall: 140#/30" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date Start/Finish: 5/21/2015; 08:55-13:05 | | | | Drilling Method: Hollow Stem Auger | | | | Core Barrel: N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boring Location: 26+75, 8.8 ft Lt. | | | | Casing ID/OD: N/A | | | | Water Level*: 56.6 ft inside augers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hammer Efficiency Factor: 0.6 | | | | Hammer Type: Automatic <input type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample attempt V = Insitu Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Insitu Vane Shear Test attempt | | | | R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = weight of 140lb. hammer WOR/C = weight of rods or casing WO1P = Weight of one person | | | | Su = Insitu Field Vane Shear Strength (psf) Tv = Pocket Torvane Shear Strength (psf) qp = Unconfined Compressive Strength (ksf) N-uncorrected = Raw field SPT N-value Hammer Efficiency Factor = Annual Calibration Value N60 = SPT N-uncorrected corrected for hammer efficiency N60 = (Hammer Efficiency Factor/60%)*N-uncorrected | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Su(lab) = Lab Vane Shear Strength (psf) WC = water content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th colspan="10">Sample Information</th><th rowspan="2">Graphic Log</th><th rowspan="2">Visual Description and Remarks</th><th rowspan="2">Laboratory Testing Results/ AASHTO and Unified Class</th></tr><tr><th>Depth (ft.)</th><th>Sample No.</th><th>Pen./Rec. (in.)</th><th>Sample Depth (ft.)</th><th>Blows (6 in.) Shear Strength (psf) or RQD (%)</th><th>N-uncorrected</th><th>N60</th><th>Casing</th><th>Blows</th><th>Elevation (ft.)</th></tr><tr><td>50</td><td>10D</td><td>24/17</td><td>50.00 - 52.00</td><td>11/15/19/42</td><td>34</td><td>34</td><td></td><td></td><td></td><td rowspan="12"></td><td>Tan, damp, dense, fine SAND, trace medium sand, trace silt. Gravel in tip of spoon.</td><td rowspan="12">G#263904 A-2-4, SM WC=12.6%</td></tr><tr><td>55</td><td>11D</td><td>24/15</td><td>55.00 - 57.00</td><td>15/23/38/33</td><td>61</td><td>61</td><td></td><td></td><td></td><td>Tan to grey, wet, very dense, multiple layers approximately 3 inches thick varying from Silty fine SAND to fine to coarse SAND, some silt, trace gravel.</td></tr><tr><td>60</td><td>12D</td><td>24/12</td><td>60.00 - 62.00</td><td>12/17/10/18</td><td>27</td><td>27</td><td></td><td></td><td></td><td>Tan-grey, wet, medium dense, fine to coarse SAND, some gravel, little silt.</td></tr><tr><td>65</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="8">Bottom of Exploration at 62.00 feet below ground surface. NO REFUSAL</td></tr><tr><td>70</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>75</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> | | | | | | | | | | | | Sample Information | | | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class | Depth (ft.) | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N60 | Casing | Blows | Elevation (ft.) | 50 | 10D | 24/17 | 50.00 - 52.00 | 11/15/19/42 | 34 | 34 | | | | | Tan, damp, dense, fine SAND, trace medium sand, trace silt. Gravel in tip of spoon. | G#263904 A-2-4, SM WC=12.6% | 55 | 11D | 24/15 | 55.00 - 57.00 | 15/23/38/33 | 61 | 61 | | | | Tan to grey, wet, very dense, multiple layers approximately 3 inches thick varying from Silty fine SAND to fine to coarse SAND, some silt, trace gravel. | 60 | 12D | 24/12 | 60.00 - 62.00 | 12/17/10/18 | 27 | 27 | | | | Tan-grey, wet, medium dense, fine to coarse SAND, some gravel, little silt. | 65 | | | | | | | | | | Bottom of Exploration at 62.00 feet below ground surface. NO REFUSAL | 70 | | | | | | | | | | 75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sample Information | | | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Depth (ft.) | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N60 | Casing | Blows | Elevation (ft.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | 10D | 24/17 | 50.00 - 52.00 | 11/15/19/42 | 34 | 34 | | | | | Tan, damp, dense, fine SAND, trace medium sand, trace silt. Gravel in tip of spoon. | G#263904 A-2-4, SM WC=12.6% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | 11D | 24/15 | 55.00 - 57.00 | 15/23/38/33 | 61 | 61 | | | | | Tan to grey, wet, very dense, multiple layers approximately 3 inches thick varying from Silty fine SAND to fine to coarse SAND, some silt, trace gravel. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 60 | 12D | 24/12 | 60.00 - 62.00 | 12/17/10/18 | 27 | 27 | | | | | Tan-grey, wet, medium dense, fine to coarse SAND, some gravel, little silt. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65 | | | | | | | | | | | Bottom of Exploration at 62.00 feet below ground surface. NO REFUSAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Remarks: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Page 3 of 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boring No.: HB-SAB-301 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div> | | | | <div>Project: Pleasant Hill Rd Slope Failure</div> <div>(Routes 9/132)</div> <div>Location: Sabattus, Maine</div> | | <div>Boring No.: HB-SAB-302</div> <div>WIN: 19081.00</div> | | | | | |
| Driller: New England Boring | | | Elevation (ft.): 248.5 | | Auger ID/OD: 2.25/4.75" | | | | | | |
| Operator: Rudnicki/Maynard | | | Datum: NAVD88 | | Sampler: Standard Split Spoon | | | | | | |
| Logged By: Be Schonewald | | | Rig Type: Mobile Drill B-50 (Track) | | Hammer Wt./Fall: 140#/30" | | | | | | |
| Date Start/Finish: 5/21/2015; 14:00-15:10 | | | Drilling Method: Hollow Stem Auger | | Core Barrel: N/A | | | | | | |
| Boring Location: 25+67, 97.0 ft Lt. | | | Casing ID/OD: N/A | | Water Level*: 4.9 ft inside augers | | | | | | |
| Hammer Efficiency Factor: 0.6 | | | Hammer Type: Automatic <input type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input checked="" type="checkbox"/> | | | | | | | | |
| <div>Definitions:</div> <div>D = Split Spoon Sample</div> <div>MD = Unsuccessful Split Spoon Sample attempt</div> <div>U = Thin Wall Tube Sample</div> <div>MU = Unsuccessful Thin Wall Tube Sample attempt</div> <div>V = Insitu Vane Shear Test, PP = Pocket Penetrometer</div> <div>MV = Unsuccessful Insitu Vane Shear Test attempt</div> <div>R = Rock Core Sample</div> <div>SSA = Solid Stem Auger</div> <div>HSA = Hollow Stem Auger</div> <div>RC = Roller Cone</div> <div>WOH = weight of 140lb. hammer</div> <div>WOR/C = weight of rods or casing</div> <div>WO1P = Weight of one person</div> <div>S_u = Insitu Field Vane Shear Strength (psf)</div> <div>T_v = Pocket Torvane Shear Strength (psf)</div> <div>q_p = Unconfined Compressive Strength (ksf)</div> <div>N-uncorrected = Raw field SPT N-value</div> <div>Hammer Efficiency Factor = Annual Calibration Value</div> <div>N₆₀ = SPT N-uncorrected corrected for hammer efficiency</div> <div>N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected</div> <div>S_{u(lab)} = Lab Vane Shear Strength (psf)</div> <div>WC = water content, percent</div> <div>LL = Liquid Limit</div> <div>PL = Plastic Limit</div> <div>PI = Plasticity Index</div> <div>G = Grain Size Analysis</div> <div>C = Consolidation Test</div> | | | | | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/AASHTO and Unified Class. |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N ₆₀ | Casing Blows | Elevation (ft.) | | | |
| 0 | | | | | | | HSA | | Many cobbles and boulders on surface; area of cattail reeds. Boney material to approximately 10.0 ft bgs. | | |
| 5 | 1D | 24/10 | 5.00 - 7.00 | 6/14/8/4 | 22 | 22 | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | 2D | 24/11 | 10.00 - 12.00 | 14/10/5/6 | 15 | 15 | | | Brown, wet, medium dense, fine to coarse SAND, little to some gravel, trace silt. | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 15 | 3D | 24/9 | 15.00 - 17.00 | 9/12/12/8 | 24 | 24 | | | Brown, wet, medium dense, fine to medium SAND, trace coarse sand, trace silt, trace gravel. | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 20 | 4D | 24/11 | 20.00 - 22.00 | 15/8/8/9 | 16 | 16 | | | Brown, wet, medium dense, fine to medium SAND, trace coarse sand, trace silt, trace fine gravel. | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 25 | | | | | | | | 226.50 | 22.00 | Bottom of Explorations at 22.00 feet below ground surface. NO REFUSAL | |
| Remarks: <div>Located in gravel pit at toe of slope.</div> | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | Page 1 of 1 | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | Boring No.: HB-SAB-302 | |

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| <div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div> | | | | <div>Project: Pleasant Hill Rd Slope Failure</div> <div>(Routes 9/132)</div> <div>Location: Sabattus, Maine</div> | | <div>Boring No.:</div> <div>HB-SAB-303</div> <div>WIN:</div> <div>19081.00</div> | | | | | |
| Driller: New England Boring | | | Elevation (ft.): 248.5 | | Auger ID/OD: 2.25/4.75" | | | | | | |
| Operator: Rudnicki/Maynard | | | Datum: NAVD88 | | Sampler: Standard Split Spoon | | | | | | |
| Logged By: Be Schonewald | | | Rig Type: Mobile Drill B-50 (Track) | | Hammer Wt./Fall: 140#/30" | | | | | | |
| Date Start/Finish: 5/21/2015; 15:15-16:15 | | | Drilling Method: Hollow Stem Auger | | Core Barrel: N/A | | | | | | |
| Boring Location: 26+73, 106.0 ft Lt. | | | Casing ID/OD: N/A | | Water Level*: 5.0 ft inside augers | | | | | | |
| Hammer Efficiency Factor: 0.6 | | | Hammer Type: Automatic <input type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input checked="" type="checkbox"/> | | | | | | | | |
| <div>Definitions:</div> <div>D = Split Spoon Sample</div> <div>MD = Unsuccessful Split Spoon Sample attempt</div> <div>U = Thin Wall Tube Sample</div> <div>MU = Unsuccessful Thin Wall Tube Sample attempt</div> <div>V = Insitu Vane Shear Test, PP = Pocket Penetrometer</div> <div>MV = Unsuccessful Insitu Vane Shear Test attempt</div> <div>R = Rock Core Sample</div> <div>SSA = Solid Stem Auger</div> <div>HSA = Hollow Stem Auger</div> <div>RC = Roller Cone</div> <div>WOH = weight of 140lb. hammer</div> <div>WOR/C = weight of rods or casing</div> <div>WO1P = Weight of one person</div> <div>S_u = Insitu Field Vane Shear Strength (psf)</div> <div>T_v = Pocket Torvane Shear Strength (psf)</div> <div>q_p = Unconfined Compressive Strength (ksf)</div> <div>N-uncorrected = Raw field SPT N-value</div> <div>Hammer Efficiency Factor = Annual Calibration Value</div> <div>N₆₀ = SPT N-uncorrected corrected for hammer efficiency</div> <div>N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected</div> <div>S_{u(lab)} = Lab Vane Shear Strength (psf)</div> <div>WC = water content, percent</div> <div>LL = Liquid Limit</div> <div>PL = Plastic Limit</div> <div>PI = Plasticity Index</div> <div>G = Grain Size Analysis</div> <div>C = Consolidation Test</div> | | | | | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/AASHTO and Unified Class. |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N ₆₀ | Casing Blows | Elevation (ft.) | | | |
| 0 | | | | | | | HSA | | | | |
| 5 | 1D | 24/11 | 5.00 - 7.00 | 6/9/9/11 | 18 | 18 | | | | Brown, wet, medium dense, fine to coarse SAND, some gravel, trace silt. | G#263323 A-1-b, SW-SM WC=11.7% |
| 10 | 2D | 24/8 | 10.00 - 12.00 | 16/20/10/12 | 30 | 30 | | | | Brown, wet, medium dense, fine to coarse Sandy GRAVEL, little silt. Gravel in tip of spoon. | |
| 15 | 3D | 24/8 | 15.00 - 17.00 | 17/16/13/14 | 29 | 29 | | | | Brown, wet, medium dense, Gravelly fine to coarse SAND, trace silt. | G#263324 A-1-a, SW-SM WC=9.2% |
| 20 | 4D | 24/13 | 20.00 - 22.00 | 16/15/14/17 | 29 | 29 | | | | Brown, wet, medium dense, GRAVEL, some fine to coarse sand, trace to little silt. | |
| 22.00 | | | | | | | | 226.50 | | Bottom of Exploration at 22.00 feet below ground surface. NO REFUSAL | |
| 25 | | | | | | | | | | | |
| Remarks: Located in gravel pit at toe of slope. | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | Page 1 of 1 | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | Boring No.: HB-SAB-303 | |

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| <div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div> | | | | <div>Project: Pleasant Hill Rd Slope Failure</div> <div>(Routes 9/132)</div> <div>Location: Sabattus, Maine</div> | | <div>Boring No.:</div> <div>HB-SAB-304</div> <div>WIN:</div> <div>19081.00</div> | | | | | |
| Driller: New England Boring | | Elevation (ft.): 256.5 | | Auger ID/OD: 2.25/4.75" | | | | | | | |
| Operator: Rudnicki/Maynard | | Datum: NAVD88 | | Sampler: Standard Split Spoon | | | | | | | |
| Logged By: Be Schonewald | | Rig Type: Mobile Drill B-50 (Track) | | Hammer Wt./Fall: 140#/30" | | | | | | | |
| Date Start/Finish: 5/21/2015; 16:25-17:20 | | Drilling Method: Hollow Stem Auger | | Core Barrel: N/A | | | | | | | |
| Boring Location: 32+31, 97.0 ft Lt. | | Casing ID/OD: N/A | | Water Level*: 11.0 ft inside augers | | | | | | | |
| Hammer Efficiency Factor: 0.6 | | Hammer Type: Automatic <input type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input checked="" type="checkbox"/> | | | | | | | | | |
| <div>Definitions:</div> <div>D = Split Spoon Sample</div> <div>MD = Unsuccessful Split Spoon Sample attempt</div> <div>U = Thin Wall Tube Sample</div> <div>MU = Unsuccessful Thin Wall Tube Sample attempt</div> <div>V = Insitu Vane Shear Test, PP = Pocket Penetrometer</div> <div>MV = Unsuccessful Insitu Vane Shear Test attempt</div> <div>R = Rock Core Sample</div> <div>SSA = Solid Stem Auger</div> <div>HSA = Hollow Stem Auger</div> <div>RC = Roller Cone</div> <div>WOH = weight of 140lb. hammer</div> <div>WOR/C = weight of rods or casing</div> <div>WO1P = Weight of one person</div> <div>S_u = Insitu Field Vane Shear Strength (psf)</div> <div>T_v = Pocket Torvane Shear Strength (psf)</div> <div>q_p = Unconfined Compressive Strength (ksf)</div> <div>N_{uncorrected} = Raw field SPT N-value</div> <div>Hammer Efficiency Factor = Annual Calibration Value</div> <div>N₆₀ = SPT N_{uncorrected} corrected for hammer efficiency</div> <div>N₆₀ = (Hammer Efficiency Factor/60%)*N_{uncorrected}</div> <div>S_{u(lab)} = Lab Vane Shear Strength (psf)</div> <div>WC = water content, percent</div> <div>LL = Liquid Limit</div> <div>PL = Plastic Limit</div> <div>PI = Plasticity Index</div> <div>G = Grain Size Analysis</div> <div>C = Consolidation Test</div> | | | | | | | | | | | |
| Depth (ft.) | Sample Information | | | | | | | | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/AASHTO and Unified Class. |
| | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (/6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N ₆₀ | Casing Blows | Elevation (ft.) | | | |
| 0 | | | | | | | HSA | | | | |
| 5 | 1D | 24/18 | 5.00 - 7.00 | 6/5/5/4 | 10 | 10 | | | | Tan, damp, loose, fine SAND, trace silt. | G#263906 A-3, SP-SM WC=4.2% |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | 2D | 24/18 | 10.00 - 12.00 | 5/7/6/9 | 13 | 13 | | | | Tan, damp to wet, medium dense, fine SAND, trace silt. | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 15 | 3D | 24/15 | 15.00 - 17.00 | 4/4/5/4 | 9 | 9 | | | | Tan, wet, loose, fine SAND, trace silt. | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 20 | 4D | 24/14 | 20.00 - 22.00 | 4/5/8/24 | 13 | 13 | | | | Tan, wet, medium dense, fine to coarse SAND, little silt, little gravel. | G#263907 A-2-4, SM WC=19.2% |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 234.50 | | | | | | | | | | | |
| 22.00 | | | | | | | | | | Bottom of Exploration at 22.00 feet below ground surface. NO REFUSAL | |
| 25 | | | | | | | | | | | |
| <div>Remarks:</div> <div>Located in gravel pit at toe of slope.</div> <div>Area appears to have sloughed recently; top of slope undercut.</div> | | | | | | | | | | | |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual. | | | | | | | | | | Page 1 of 1 | |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made. | | | | | | | | | | Boring No.: HB-SAB-304 | |

Appendix B

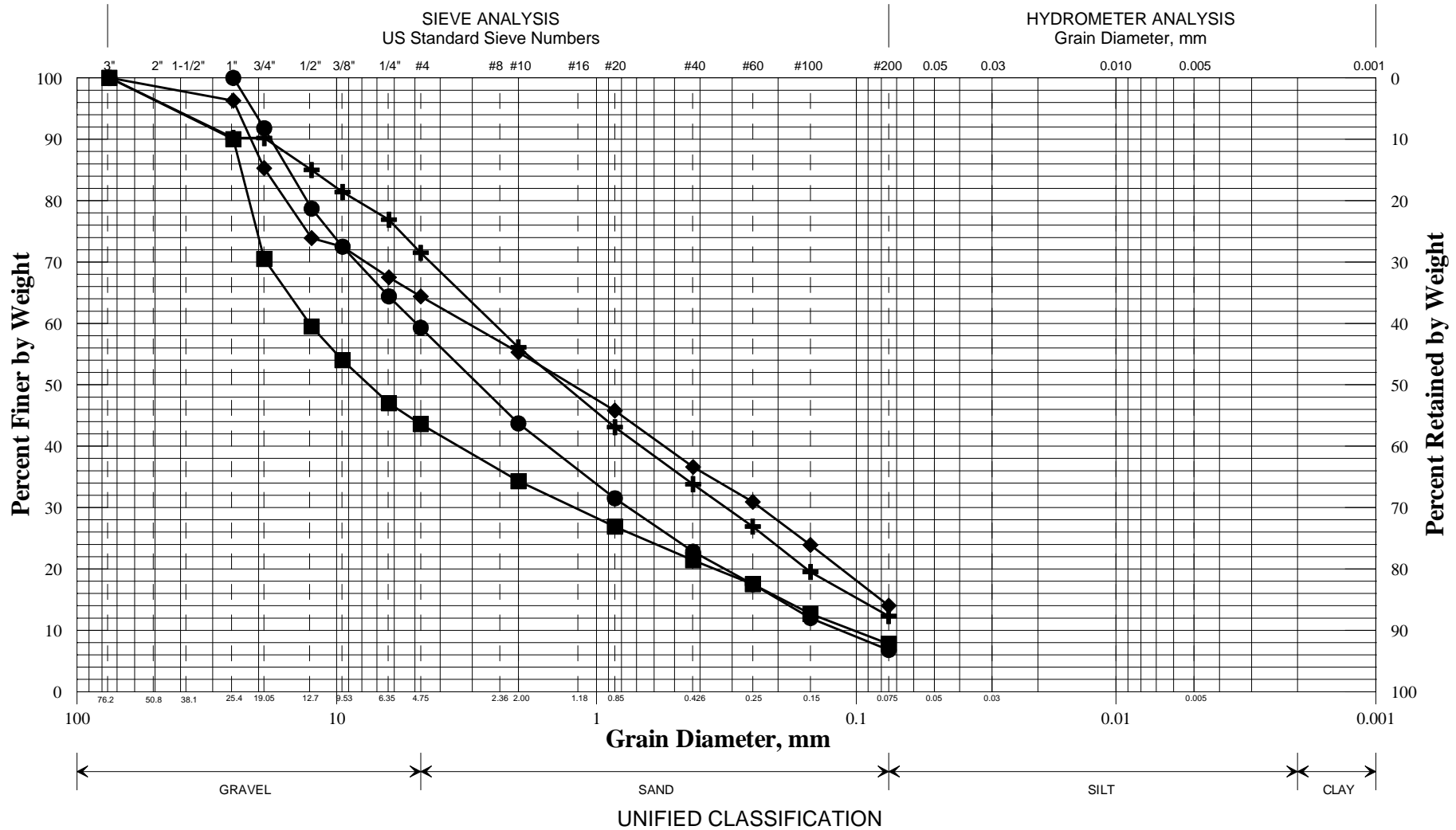
Laboratory Test Results

Work Number: 19081.00

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MaineDOT and Corps of Engineers Classification Systems.

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

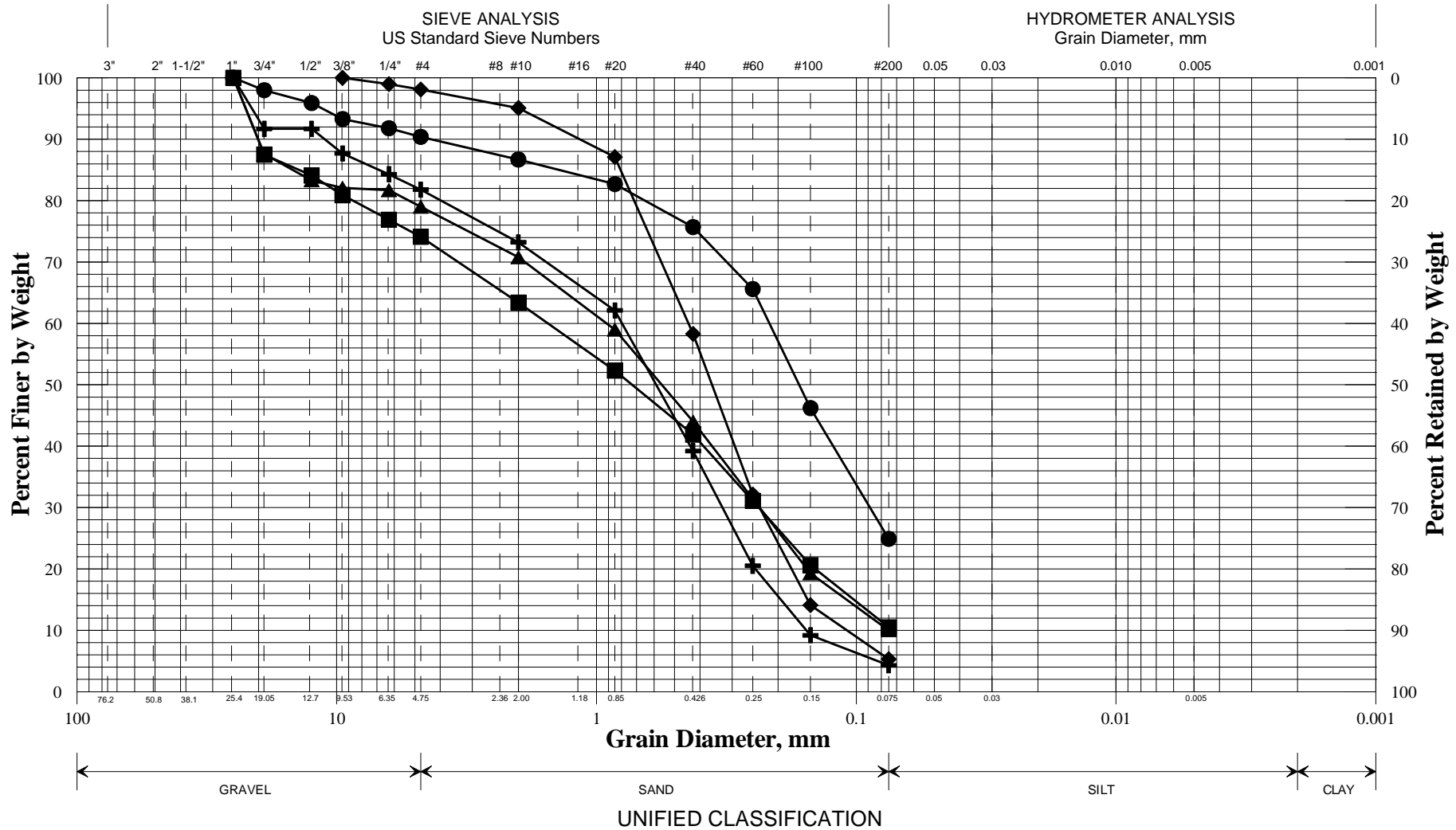
State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



| | Boring/Sample No. | Station | Offset, ft | Depth, ft | Description | W, % | LL | PL | PI |
|---|-------------------|---------|------------|-----------|---------------------------------|------|----|----|----|
| + | HB-SAB-201/1D | 21+77 | 9.2 RT | 5.0-6.5 | SAND, some gravel, little silt. | 2.8 | | | |
| ◆ | HB-SAB-201/2D | 21+77 | 9.2 RT | 10.0-12.0 | SAND, some gravel, little silt. | 7.3 | | | |
| ■ | HB-SAB-201/3D | 21+77 | 9.2 RT | 14.0-16.0 | GRAVEL, some sand, trace silt. | 7.3 | | | |
| ● | HB-SAB-201/4D | 21+77 | 9.2 RT | 19.0-21.0 | Gravelly SAND, trace silt. | 10.5 | | | |
| ▲ | | | | | | | | | |
| × | | | | | | | | | |

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| WIN |
| 019081.00 |
| Town |
| Sabattus |
| Reported by/Date |
| WHITE, TERRY A 1/15/2015 |

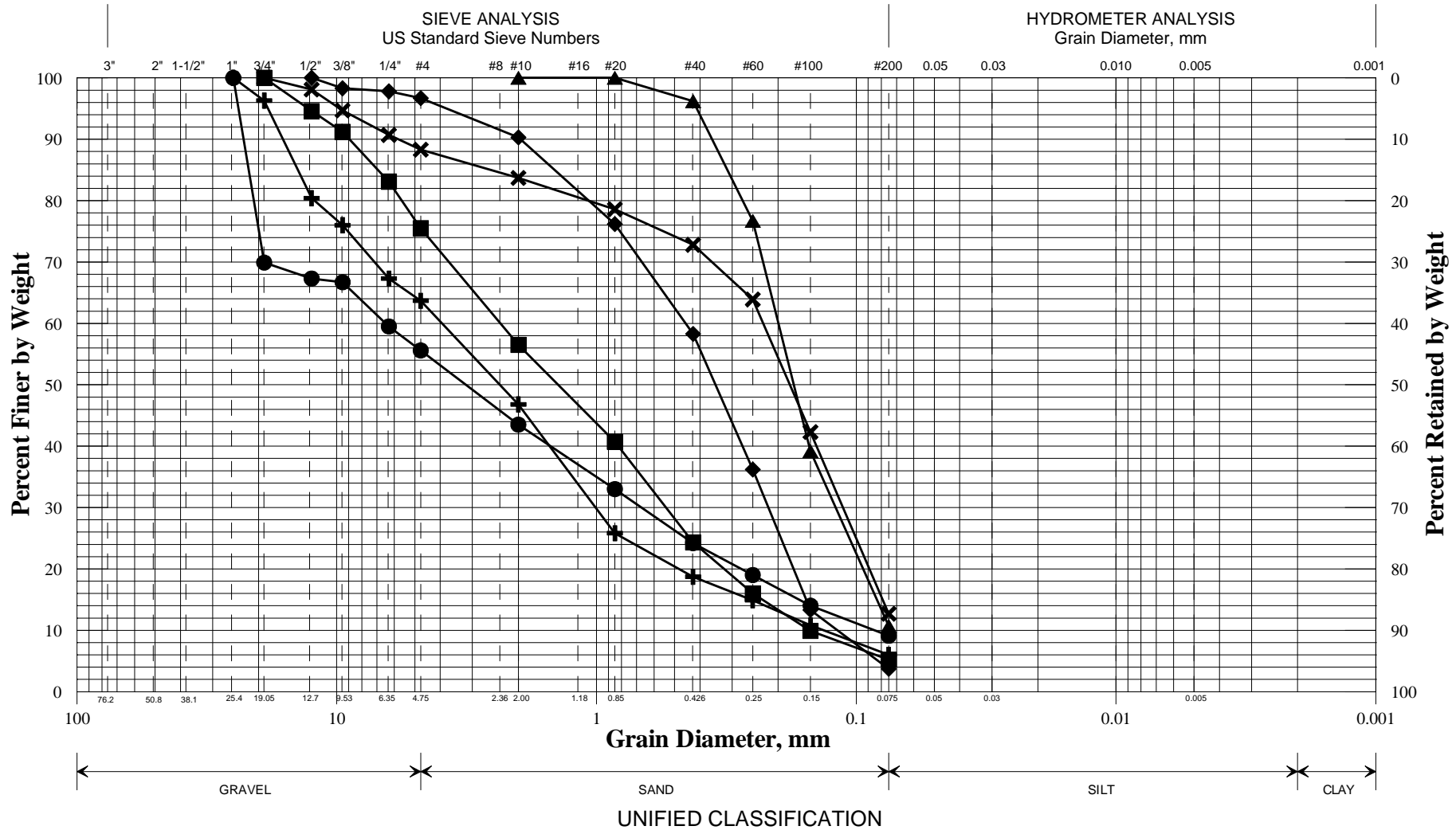
State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



| | Boring/Sample No. | Station | Offset, ft | Depth, ft | Description | W, % | LL | PL | PI |
|---|-------------------|---------|------------|-----------|----------------------------------|------|----|----|----|
| + | HB-SAB-301/2D | 26+75 | 8.8 LT | 10.0-12.0 | SAND, little gravel, trace silt. | 1.8 | | | |
| ◆ | HB-SAB-301/6D | 26+75 | 8.8 LT | 30.0-32.0 | SAND, trace silt, trace gravel. | 5.1 | | | |
| ■ | HB-SAB-301/9D | 26+75 | 8.8 LT | 45.0-47.0 | SAND, some gravel, little silt. | 2.2 | | | |
| ● | HB-SAB-301/11D | 26+75 | 8.8 LT | 55.0-57.0 | SAND, some silt, trace gravel. | 12.6 | | | |
| ▲ | HB-SAB-301/12D | 26+75 | 8.8 LT | 60.0-62.0 | SAND, some gravel, little silt. | 12.6 | | | |
| × | | | | | | | | | |

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| WIN |
| 019081.00 |
| Town |
| Sabattus |
| Reported by/Date |
| WHITE, TERRY A 6/17/2015 |

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

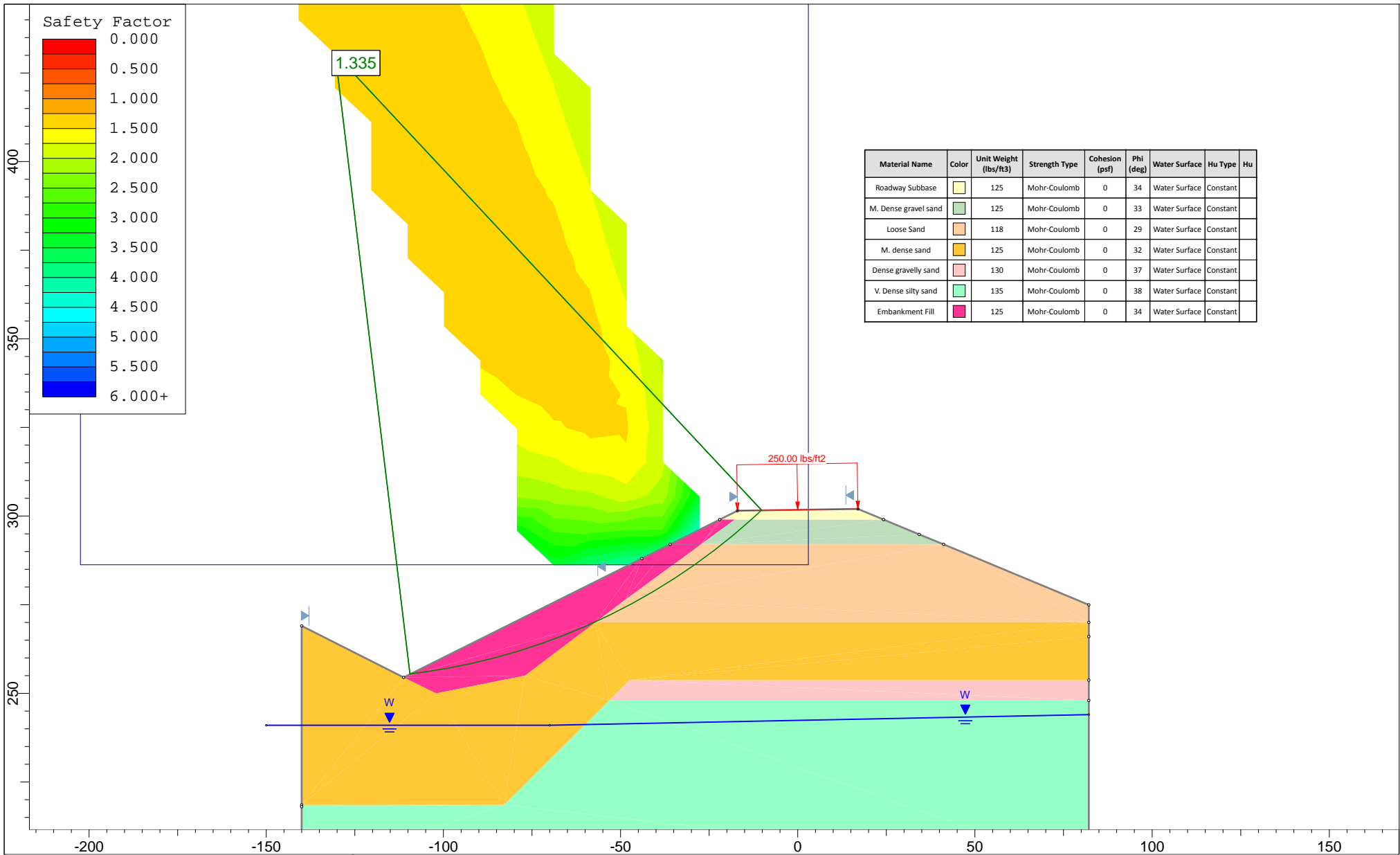



| | Boring/Sample No. | Station | Offset, ft | Depth, ft | Description | W, % | LL | PL | PI |
|---|-------------------|---------|------------|-----------|-----------------------------------|------|----|----|----|
| + | HB-SAB-302/1D | 25+67 | 97.0 LT | 5.0-7.0 | Gravelly SAND, trace silt. | 14.8 | | | |
| ◆ | HB-SAB-302/3D | 25+67 | 97.0 LT | 15.0-17.0 | SAND, trace silt, trace gravel. | 18.0 | | | |
| ■ | HB-SAB-303/1D | 26+73 | 106.0 LT | 5.0-7.0 | SAND, some gravel, trace silt. | 11.7 | | | |
| ● | HB-SAB-303/3D | 26+73 | 106.0 LT | 15.0-17.0 | Gravelly SAND, trace silt. | 9.2 | | | |
| ▲ | HB-SAB-304/1D | 32+31 | 97.0 LT | 5.0-7.0 | SAND, trace silt. | 4.2 | | | |
| × | HB-SAB-304/4D | 32+31 | 97.0 LT | 20.0-22.0 | SAND, little silt, little gravel. | 19.2 | | | |

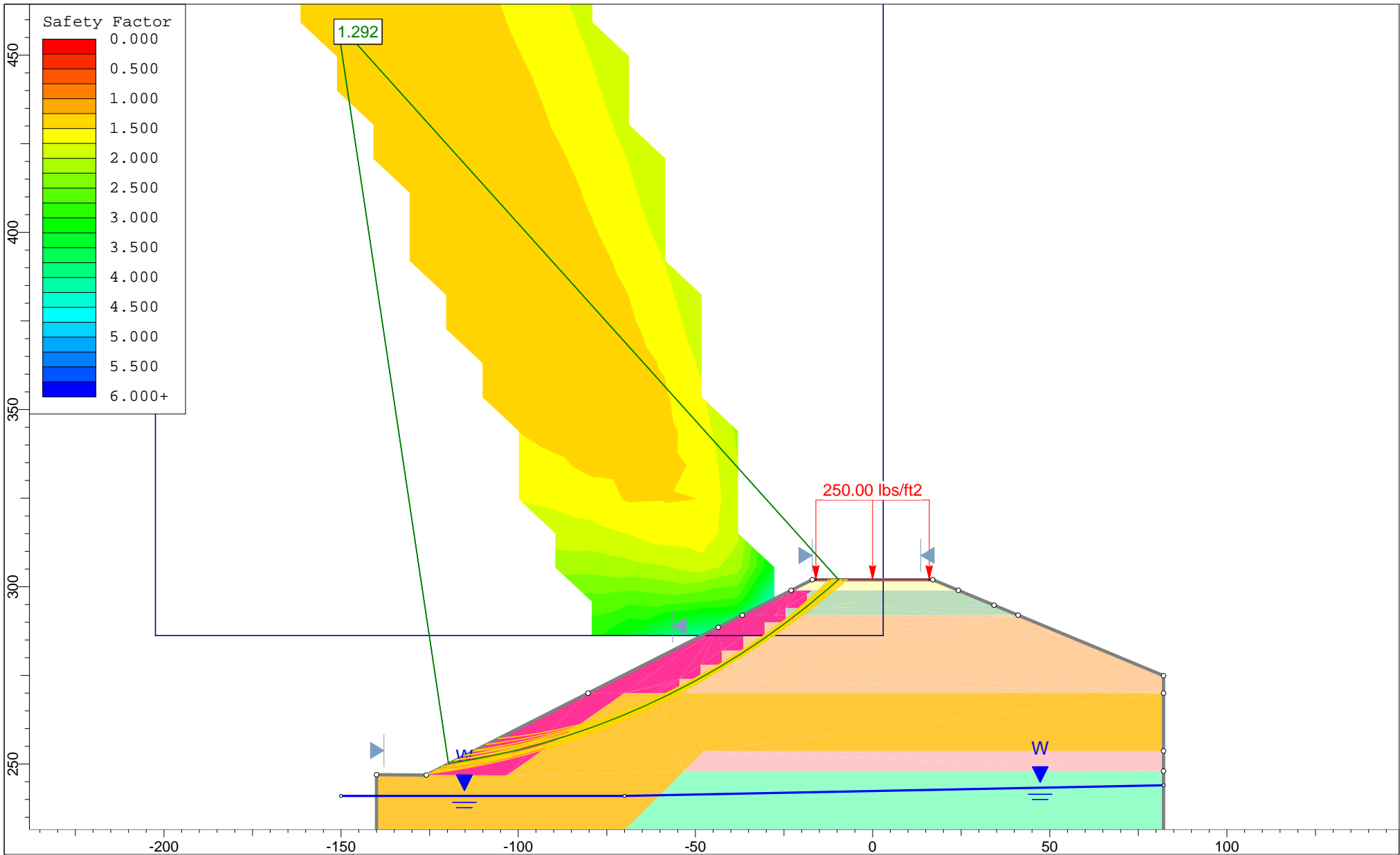
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| WIN |
| 019081.00 |
| Town |
| Sabattus |
| Reported by/Date |
| WHITE, TERRY A 6/17/2015 |

Appendix C

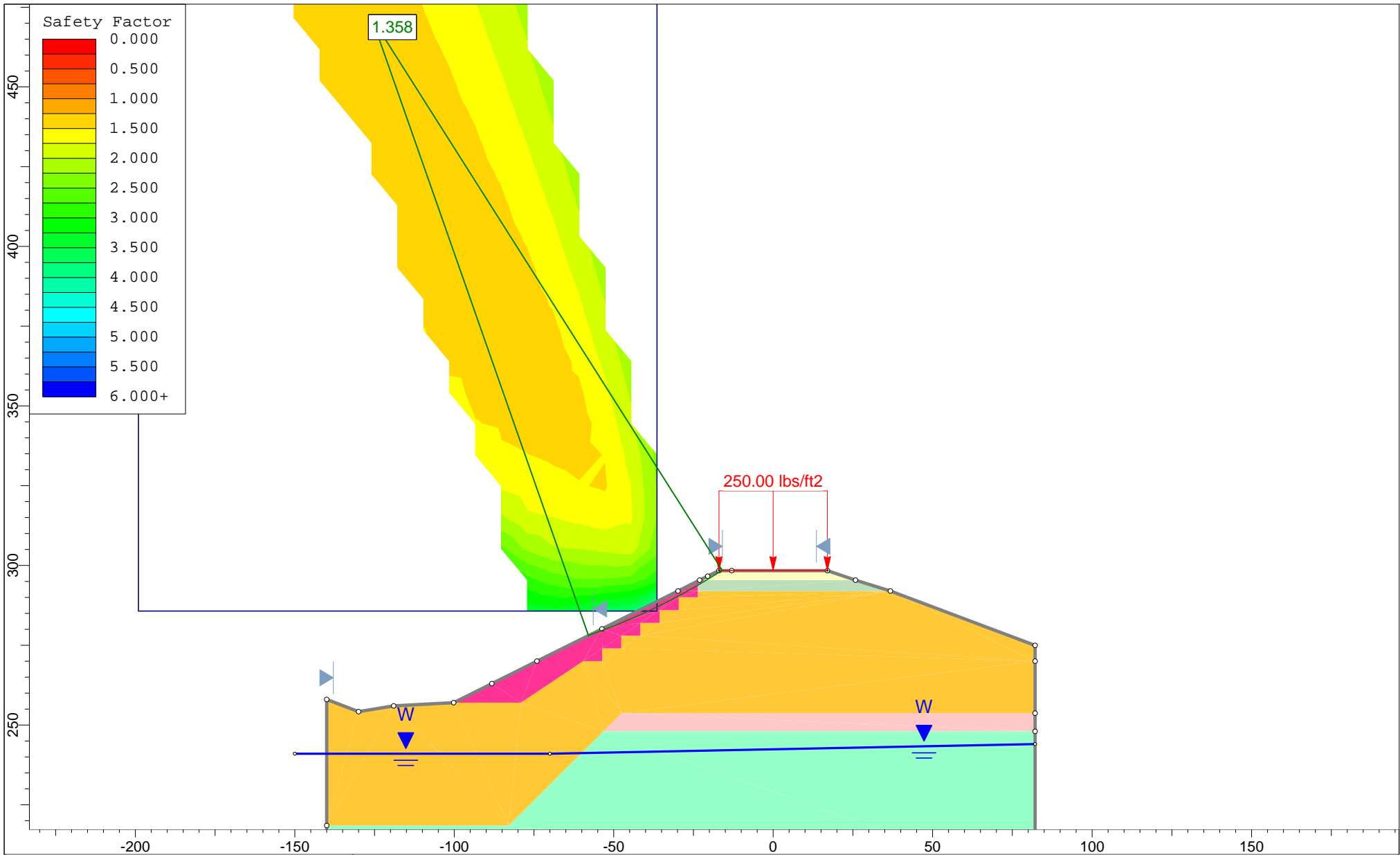
SLIDE 6.0 Analyses



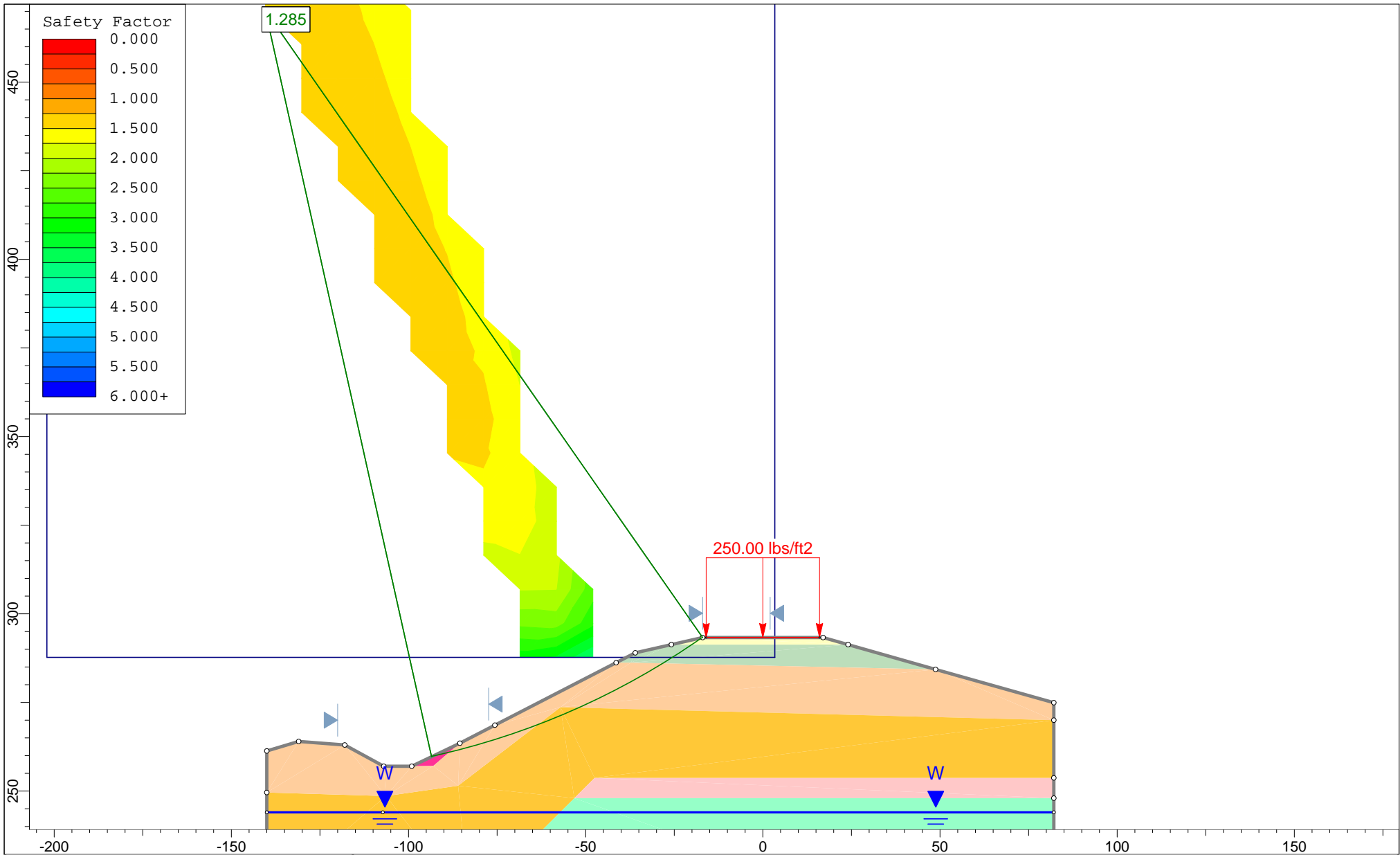
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|---|----------------------|--|---------------------|-------------------------------|-------|
|  <small>SLIDEINTERPRET 6.018</small> | Project | | | 19081 Sabattus Proposed 25+50 | |
| | Analysis Description | | | | |
| | Drawn By | | MMK | Scale | 1:450 |
| | Date | | File Name | | |
| | | | 25+50 Proposed.slim | | |



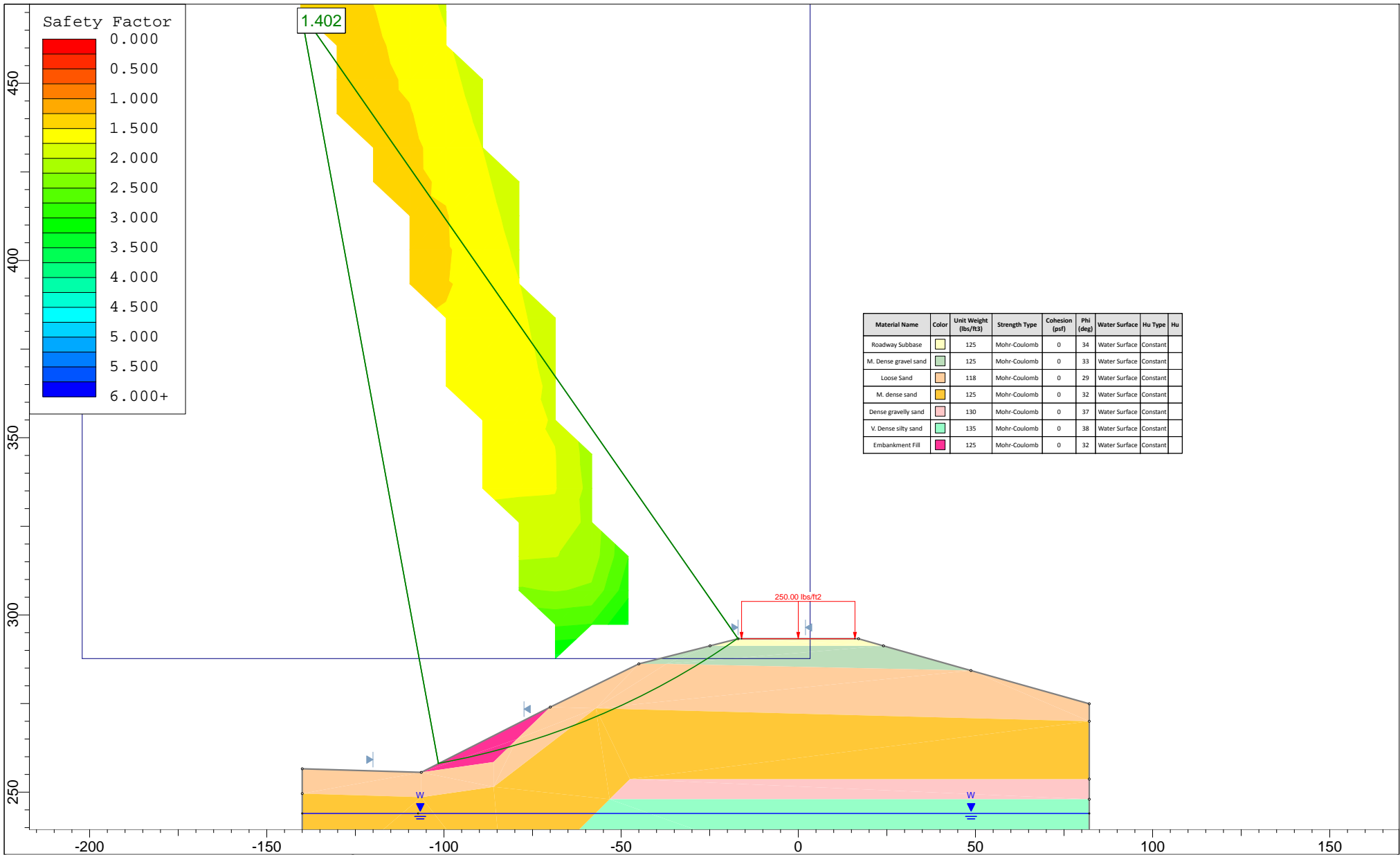
| | | | |
|-------------------------------|-----------------------|-----------|-----------------------------------|
| Project | | | |
| 19081 Sabattus Proposed 26+50 | | | |
| Analysis Description | | | |
| Drawn By | MMK | Scale | 1:450 |
| Date | 8/15/2015, 9:11:23 AM | Company | |
| | | File Name | 26+50 Proposed with benching.slim |



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|-------------------------------|-----------------------|-----------|-----------------------------------|
| Project | | | |
| 19081 Sabattus Proposed 28+00 | | | |
| Analysis Description | | | |
| Drawn By | MMK | Scale | 1:500 |
| Date | 8/15/2015, 9:11:23 AM | Company | |
| | | File Name | 28+00 Proposed with benching.slim |



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|-------------------------------|-----------------------|-----------|---------------------|
| Project | | | |
| 19081 Sabattus Proposed 31+50 | | | |
| Analysis Description | | | |
| Drawn By | MMK | Scale | 1:450 |
| Date | 8/15/2015, 9:11:23 AM | Company | |
| | | File Name | 31+50 Proposed.slim |



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| | Project | | |
| | 19081 Sabattus Proposed 32+50 | | |
| | Analysis Description | | |
| | Drawn By | MMK | Scale |
| | | 1:450 | Company |
| | Date | 6/11/2015, 9:11:23 AM | File Name |
| | | | 32+50 Proposed.slim |